IN THIS ISSUE—CONTROL LAYOUT DESIGN ANALYZED


# The AUTOMOBILE and Automotive Industries

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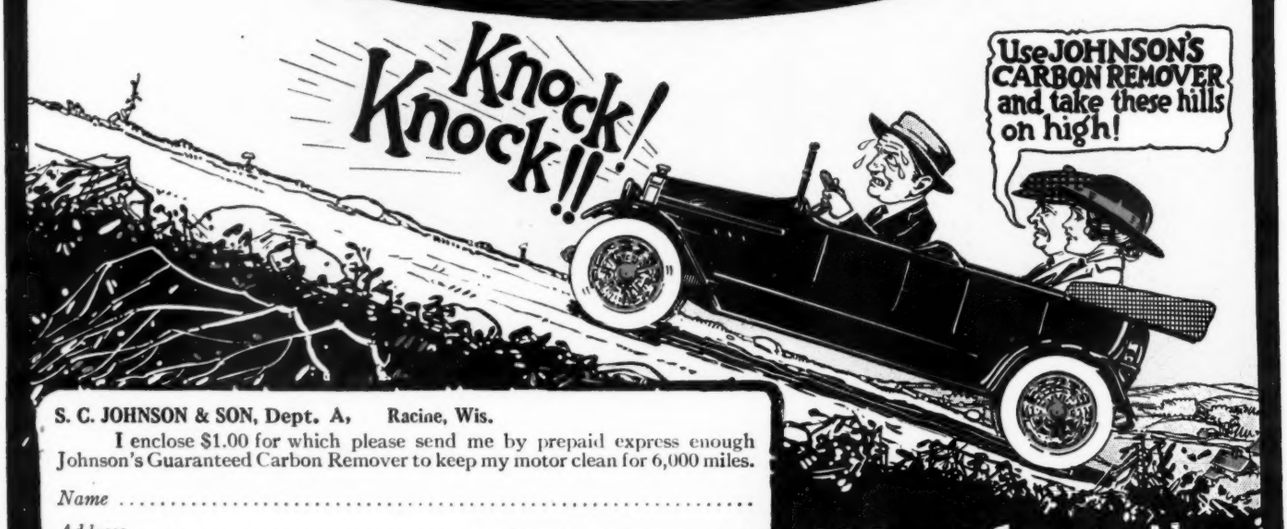


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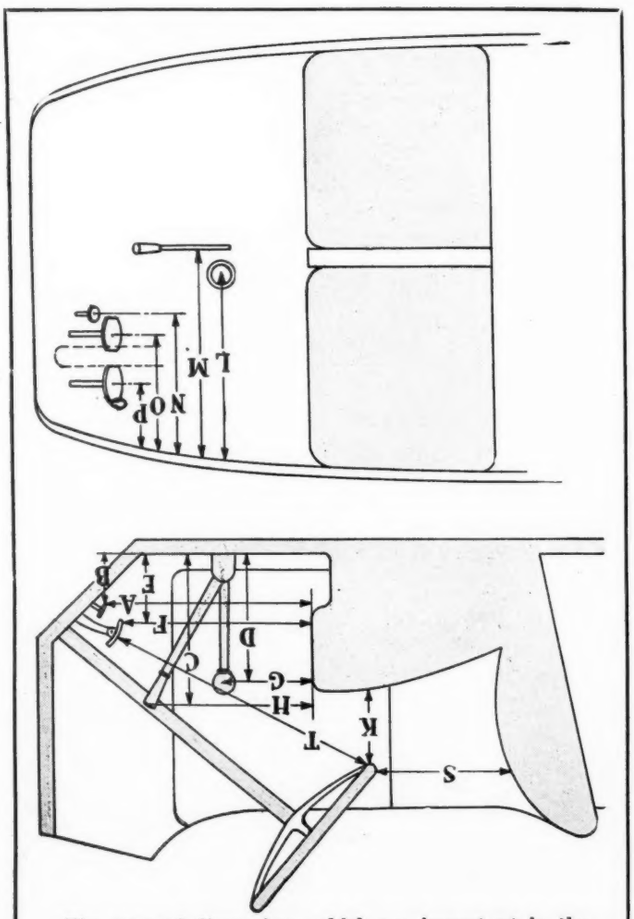
VOL. XXXVII NEW YORK—THURSDAY, SEPTEMBER 13, 1917—CHICAGO NO. 11

# Control Layout Design Analyzed




*The general dimensions which are important in the consideration of a proper control layout system*

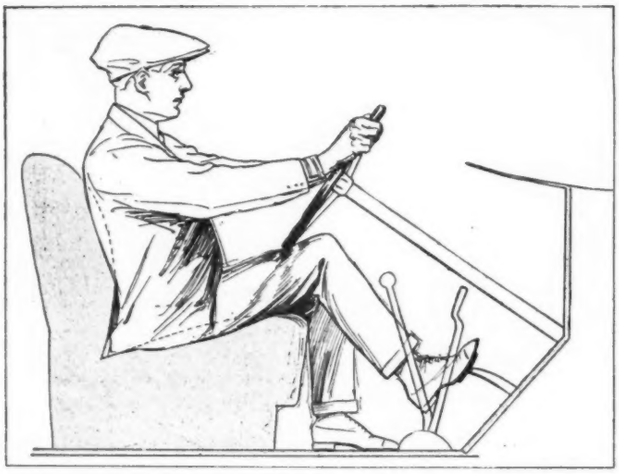
## Manufacturers Solving Problem of Best Arrangement for Safety, Comfort and Accessibility

By J. Edward Schipper

DURING the past 2 years there has been a tendency to alter the arrangement of automobile control members to permit of greater accessibility and comfort in driving. This is a healthy movement and one which should be encouraged, in view of the fact that the entire enjoyment of automobiling is wrapped up very closely with the question of ease and comfort in control. This is particularly true, as pointed out in previous articles, because of the high percentage of owners who drive their own machines.

The position of the body in the seat while driving, the line of the eye as it travels through the windshield and out on the road, the location of the foot on the accelerator, the ease in entering and leaving the driver's seat and in changing gears and otherwise manipulating the controls all go to make up the story of the success or failure of a car from the drivers' viewpoint. There are so many points to be considered and such a difference may be caused by a deviation of an inch one way or the other that the entire layout should be one of the most carefully considered points in the entire car.

There are two independent points to consider in the design of the driver's compartment; these are the problems of entrance and control accessibility. The general problem of entrance involves the location of the steering wheel, the thickness and height of the seat cushion, the location of the door, and, in the case of cars with outside brake or shifter levers, it also includes the position of these. The problem of control accessibility involves the



*Showing how the leg just above the knee strikes the bottom of the steering wheel unless care is taken in the location of the clutch and brake pedals*

location of the various units which have to do with the operation of the car, such as the accelerator, brake and clutch pedals, the steering column, and the various electrical switches, etc.

With so many variable dimensions, the number of possible combinations is very great and hence there is a wide difference in the comfort and accessibility in the different cars on the market as far as the driver's seat is concerned. In some of the cars the comfort factor is high from practically every standpoint, while in others certain features, perhaps, are better than the average, but there are other considerations which have not been worked out as well as they ought to be.

**Driver's Seat a Problem**

It has been pointed out on many previous occasions that the entire problem as to the driver's seat has not been solved as well as it might be in a great many cars, this being probably due to the fact that the distance between the steering wheel and the edge of the body at the front door is too small. It has also been stated that the width of this door does not make nearly so much difference as the clearance between the edges of the body and the steering wheel or the seat upholstery and the steering wheel. On cars which have been measured, the actual entrance width at the narrowest points has been as low as 4½ in., while the door width is quite ample. It is, of course, useless to put a wide door on the car and then have the space between the steering wheel and the edge of the body so small that the driver can hardly wedge his way through.

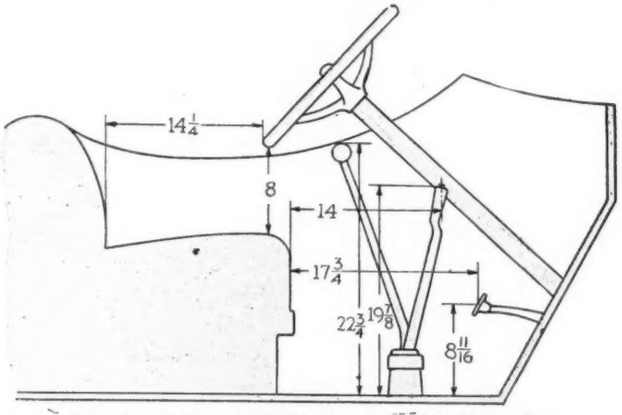
As this entrance problem has been dealt with quite specifically in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES on previous occasions, it would be perhaps better to give a little more attention to the actual control accessibility in this article. When the driver has reached his seat, he will unconsciously settle himself to meet the conditions necessary for driving. If the car is a new one to him, his eye will search out the various units comprising the control set, so that he will be able to locate them should occasion demand. If he is used to the car his subconscious mind visualizes the control layout so that he can place his hand upon any member without having to take his eyes from the road ahead. The more easily the driver falls into this habit and the more natural it is for him to do so, the better the control arrangement.

Referring to the drawing on page 435, some of the most important dimensions having to do with the accessibility of the control system are illustrated. Each of these plays an important part in determining whether or not any particular car is a good car to drive or one that is difficult to operate for long periods of time without becoming fatigued. These dimensions also determine the readiness with which the car can be controlled, and have an important bearing on the time factor necessary for operating the members of the control system.

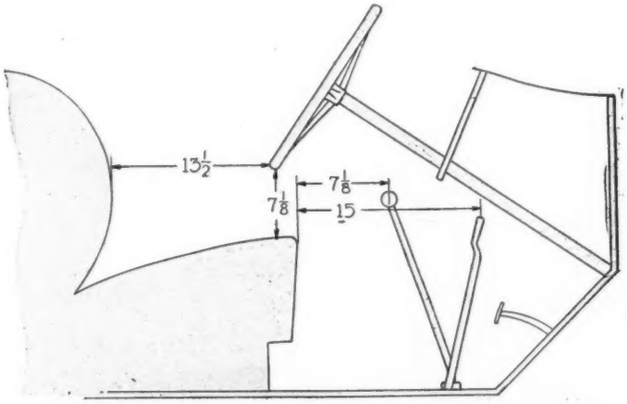
**Position of the Pedals**

Taking first the position of the pedals, the dimension *A* to the accelerator pedal and *F* to the clutch pedal locate these in reference to the edge of the front seat. On some cars this dimension is adjustable, while on others it has been found that no adjustment is necessary if the pedal distances have been made so as to easily meet the requirements of the average person. On the other hand, the dimension shown in the plan view, noted as *P*, *O* and *N*, involve a factor which is highly important from the standpoint of the comfort of the driver. The feature determined by these three dimensions is the foot space permitted the driver in operating the pedals.

There have been a great many serious accidents caused by the fact that the driver has stepped upon his accelerator pedal when he should have applied the brakes. In some cases unfamiliarity with the car has caused him to place his foot on the throttle pedal instead of the brake. In other instances the foot has slipped from the brake pedal and come down upon the accelerator pedal. The accelerator pedal should be so located that it is not possible to have the foot slip upon it from another pedal, and so it is highly important that no confusion should ever exist whereby the driver should possibly accelerate




*Layout used on the Westcott car, with dimensions*



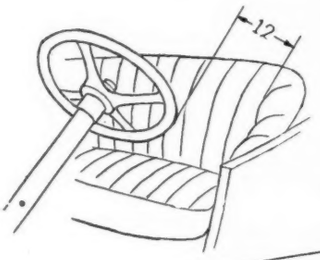

*The control layout of the Liberty showing principal dimensions*

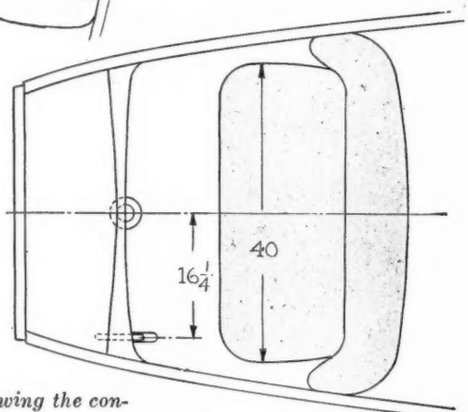
the car instead of retarding it. The difference between the dimension *O* and *N* should be such that there is at least more than the width of a shoe between the two pedals, so that if the foot does slip off the brake pedal, it will not strike the accelerator pedal, but will drop against the floor. This matter of foot slipping is not as remote as it may seem. If the driver is wearing rubber-soled shoes and happens to have been walking on wet pavement so that the bottom of his shoe is covered with moisture, it is quite likely his foot will slip off the metal pedal. When it does so it should not strike the accelerator.

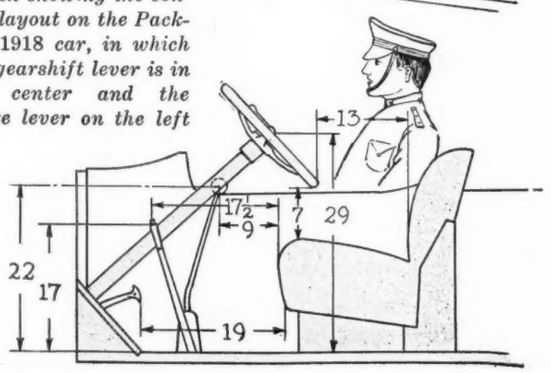
**Brake and Gearshift Levers**

Similar to the brake and accelerator pedal problems are those of the brake and gearshift levers. It has happened more than once that a driver in reaching quickly for his brake lever has taken hold of the gearshift lever instead. This is something which must be avoided, but by having the handles of the two in entirely different planes, and a sufficient distance apart, it is not easy for a driver to grasp one when he wants the other. On some cars, which, however, are not a very high percentage of the total made, the brake lever is on one side of the driver and the shifter lever on the other. This is true of the Packard 1918 car and the Locomobile, for instance.

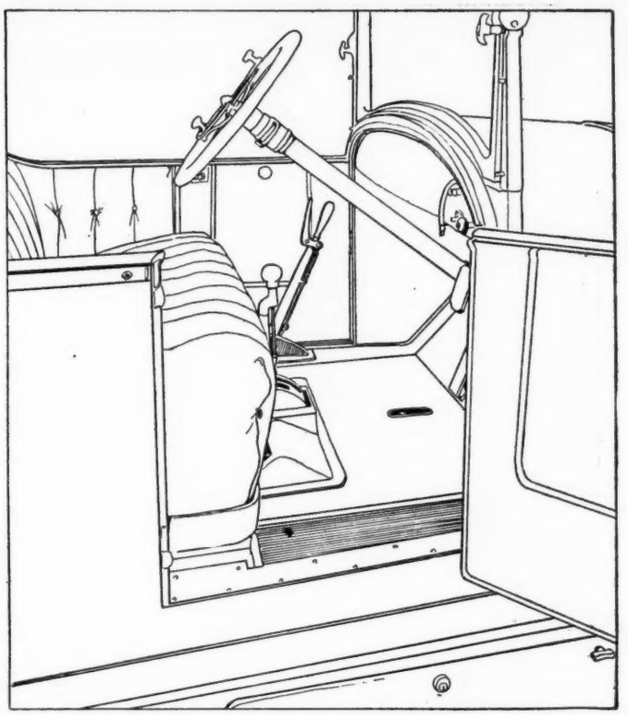
The driver should not lean to any extent to change gears. On the other hand, it does no harm to have him lean to apply the emergency brake, for the reason that this is not used to any great extent, except when the car is brought to rest for a long period or when standing on the side of a hill. In fact, it is a good thing to have the driver lean forward to secure an emergency-brake lever, because by doing so it reduces the possibility of getting one lever instead of the other. The dimensions which must be taken care of in order to bring the shifter lever within reach of the driver's hand are those shown in *D*, *G* and *L* particularly, although the depth of the seating and the position of the steering wheel have also something to do with it.




*Sketch showing the control layout on the Packard 1918 car, in which the gearshift lever is in the center and the brake lever on the left*



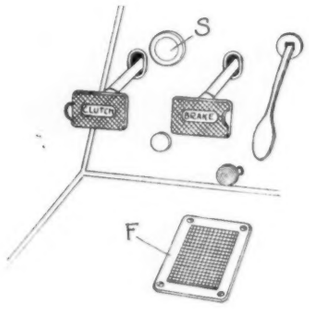
*Control system with brake lever on the left and gearshift lever in the center. Care must be taken to leave a clear passage to the left door*

It is a practice on some cars to move the shifter lever back close to the front seat and to have it vertical, while in other cars the shifter lever is moved to some distance ahead and bent back, so as to carry it in reach of the driver. Both these systems have their advantages, but probably the greatest advantage which can be claimed for the bent-lever system is that the driver and his companion can use a single lap robe for the entire width of the front seat and at the same time have the shifter lever free from interference. With the shifter lever close to the front seat, it will have to be beneath the lap robe, and cannot be reached unless the driver places his hand under the cover to do so.

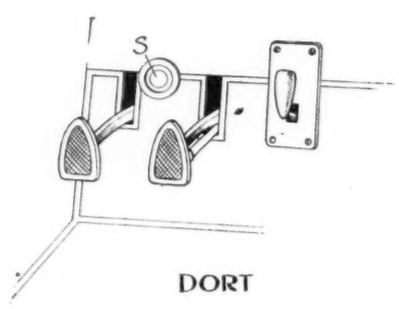
**Steering Column Position Important**

The position of the steering column, including the amount of rake and the diameter of the steering wheel, are very important from the drivers' standpoint. The bottom of the wheel must be so located that it clears the lap of the driver and permits him to use a heavy lap robe in the winter time, and the top of the wheel must be so that it does not interfere with the sight of the driver, nor cause him to look through the wheel in any car, unless it be a raceabout type. In connection with the location of the steering wheel the dimension *K*, which determines the distance between the seat cushion and the bottom rim of the wheel, and the dimension *S*, which determines the distance from the bottom of the wheel to the upholstery of the seat back, are highly important. Of still greater importance, however, is the dimension *T;* this measures the distance from the bottom of the steering wheel to the clutch pedal face. At first it would seem that this distance would not make a great amount of difference, but it becomes a matter which is of the highest

# VARIOUS ARRANGEMENTS OF CLUTCH, BRAKE AND ACCELERATOR PEDALS




WINTON

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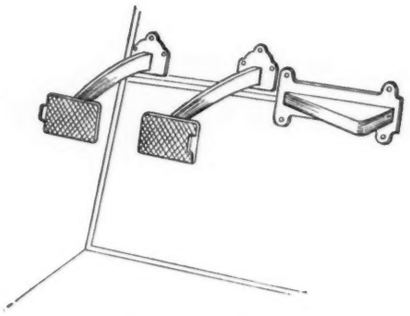
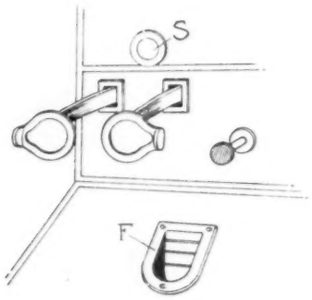
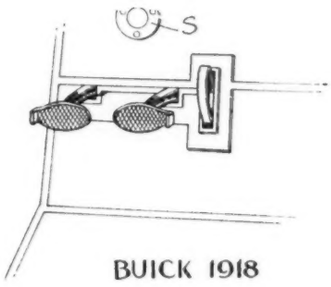


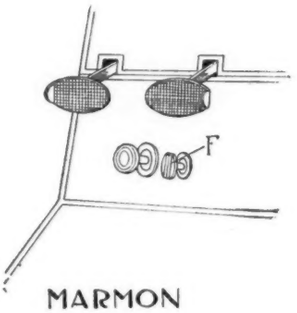
WESTCOTT



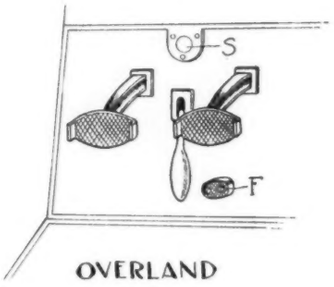

MITCHELL



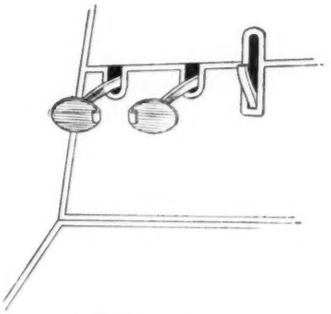

BUICK 1918



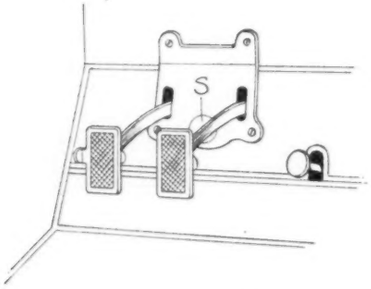

MARMON



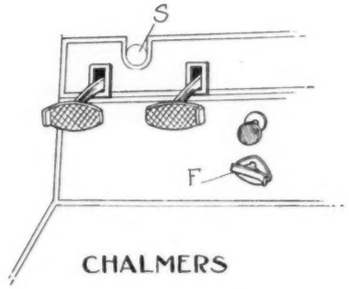

OVERLAND



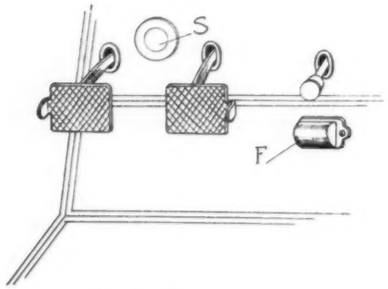
MONROE



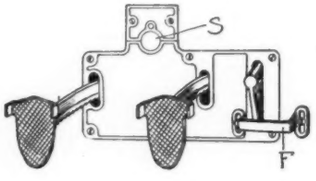

OLDSMOBILE



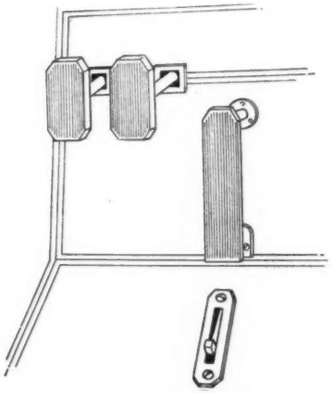

CHALMERS




KISSEL



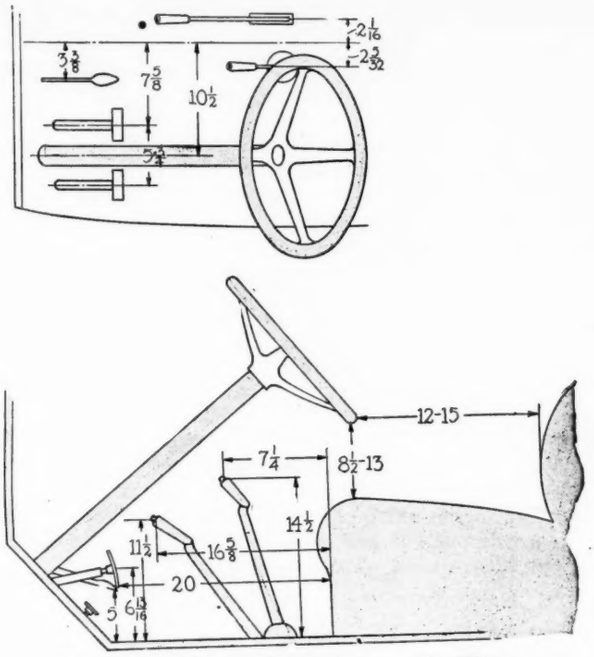

REO



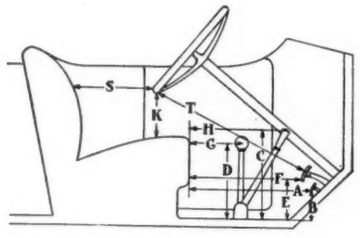
LOCOMOBILE

importance when the necessity for easy operation of the car is considered.

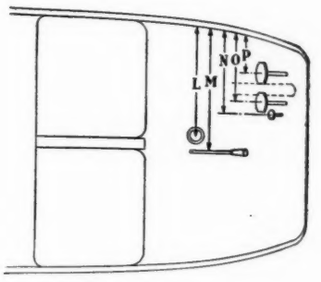
If the distance *T* is too short, the driver's leg will strike the wheel when he attempts to put his foot quickly upon the clutch pedal. If such a thing occurs it may prevent the quick stopping of the car and might lead to a serious accident. The distance should be such that it is considerably longer than the measurement of the driver's leg from the portion above the knee to the ball of his foot. In other words, the driver should be able to lift his foot quickly and place it upon the clutch pedal without any interference on the part of the steering wheel. The illustration on page 436 shows this far more clearly. It will be noted that in this, where the driver is putting his foot upon the brake pedal the lower rim of the steering wheel is touching him just above the knee. The same would hold true of the clutch pedal, because both the brake and clutch pedals are the same distance from the bottom of the steering wheel. The top rim of the steering wheel will interfere with the vision of the driver as the rake is not as it should be for the position of the seat. It is important that the driver gets a clear view of the road before him, this will not be the case if a sector of the wheel is in his way. The line of vision should probably be such that the eye clears the steering wheel when it is looking at the top of the radiator cap. If condition holds true




*Dimensions of control locations on the Winton*




## Control Layout Dimensions Used in Some Well Known Cars




| CAR | S | K | G | D | L | H | C | M | F | E | O | P | A | B | N | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hupmobile | 14½ | 6 | 9 | 19 | 18 | 18 | 18 | 22 | 16 | 10 | 10 | 3½ | 20 | 6 | 13 | 22 |
| Oldsmobile 45 | 13½ | 6½ | 6 | 17¼ | 22½ | 11 | 15 | 24 | 19 | 6 | 10 | 3½ | 21 | 5 | 14 | 25 |
| Mitchell D-48 | 14 | 6½ | 8¼ | 16½ | 20½ | 13¼ | 15 | 17 | 17 | 5½ | 11½ | 6½ | 19 | 4¼ | 15½ | 24 |
| Chalmers B-35 | 13 | 8 | 4½ | 16½ | 18½ | 13 | 14¾ | 21¼ | 17 | 6¾ | 11½ | 4¾ | 16½ | 4½ | 15 | 25½ |
| Studebaker Adjustable 18-6 | 14½ | 8½ | 7 | 15 | 18 | 13½ | 13¼ | 23 | 19 | 8 | 12½ | 6 | 19 | 4 | 15 | 27 |
| Overland 85-4 | 15½ | 7½ | 7 | 15½ | 17 | 11¾ | 16¾ | 21 | 18 | 6 | 12 | 5 | 18 | 2 | 9 | 24 |
| Buick E-49 | 13¾ | 7½ | 3 | 19 | 19¾ | 14½ | 14½ | 22 | 15 | 6½ | 10 | 4½ | 17 | 9½ | 15 | 24¾ |
| Reo 6M | 15¼ | 7½ | 4 | 14½ | 23 | .... | .... | .... | 16 | 5½ | 14 | 7 | 22 | 6 | 17 | 24 |
| Cole 8-60 | 15 | 10 | 7¼ | 14½ | 18½ | 31 | 15 | 22 | 16 | 5¼ | 9 | 3¼ | 21 | 6 | 12½ | 25½ |
| Peerless 56 | 15 | 8 | 7¼ | 16½ | 19 | 19 | 14 | 21½ | 14¼ | 4½ | 9½ | 3½ | 16½ | 4 | 14 | 24 |
| King E-E | 15 | 8 | 9½ | 13½ | 18½ | 12 | 14 | 23 | 20 | 8¼ | 11 | 4 | 21 | 4½ | 14 | 25½ |
| Jackson Wolverine-7 | 13 | 7 | 5 | 16 | 21 | 17 | 16 | 23 | 16½ | 6 | 10½ | 3½ | 21¾ | 8½ | 14 | 24 |
| Cadillac 55 | 14 | 6½ | 6 | 20 | 21 | 17½ | 17 | 23 | 18 | 6¼ | 12 | 5½ | 19 | 4 | 16½ | 25½ |
| Pierce C-4 | 15¼ | 7½ | 4 | 14½ | 6½ | 13¼ | 18 | 2 | 16 | 6¾ | 14 | 7 | 18 | 6 | 11 | 25 |
| Jeffery 6-71 | 14½ | 8¼ | 3 | 19 | 20½ | 8½ | 21 | 23½ | 15½ | 6¾ | 13 | 6 | 19 | 7½ | 16½ | 24¼ |
| Haynes 12-41 | 15¼ | 6½ | 11 | 15 | 19 | 21 | 13 | 22 | 17¼ | 9 | 10 | 5 | 23 | 9 | 14 | 23 |
| Winton 22-A | 11½ | 9 | 7 | 15 | 15½ | 16 | 11 | 20 | 17½ | 6¼ | 10½ | 4½ | 18½ | 4½ | 14½ | 26 |
| Chevrolet F-5 | 14 | 8¼ | 10 | 6½ | 19 | 19 | 14 | 21 | 19 | 6 | 11¼ | 5¾ | 25 | 7¾ | 15 | 26½ |
| Marmon 34 | 15 | 8¼ | 4½ | 22¼ | 16 | 9 | 25 | 19½ | 18 | 7½ | 11 | 3½ | 16½ | 4 | 7 | 26 |
| Oakland-50 | 14 | 6½ | 11 | 14½ | 19½ | 13 | 17¾ | 22½ | 19 | 6½ | 10½ | 3½ | 22¾ | 6 | 16 | 26¼ |
| Average | 14.275 | 7.58 | 6.71 | 16.025 | 18.56 | 14.56 | 15.15 | 19.66 | 17.2 | 6.66 | 11.18 | 4.78 | 19.72 | 5.65 | 13.92 | 24.88 |

the maximum clearness of vision is being secured by the driver.

There are a great many little devices and arrangements resorted to by different makers to solve the problems which have been brought up. The way in which the pedals have been laid out differs in various cars as well as the manner in which the gearshift lever and emergency brake are arranged. All cars are not alike, by any means, in these respects, and a study of the accompanying sketches clearly illustrates that some are very good and others quite the reverse. In some the steering column is between the pedals, while in others it is above them. In some the accelerator pedal is close to the brake and in others it is very far away, and each of these arrangements is giving different results to the man who drives the car. THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES has drawn up a table of dimensions as observed on some of the well-known cars. These are published herewith. Below the columns is given the average of the dimension involved as indicated by the letter which corresponds to the letter in the accompanying drawings. These dimensions are important and will bear checking over in laying out future cars.

There is no reason why many of the dimensions tabulated should not have the consideration of an S. A. E. standards committee which could formulate a recommendation. Probably if any agreement was reached it would be by stating maximum and minimum dimensions for each distance. It would be of real value to the automobile user to have controls more alike.

### Other Improvements Possible

However, there are other matters besides the more important ones of major dimensions as discussed above. Throttle and ignition levers should always move the same way to get the same effect, and switches should be placed more accessibly than they normally are. On many cars the speedometer cannot be read by the driver without he either moves his head or peers through the steering wheel, and the same is true of oil gages when fitted, and ammeters. Of course there is absolutely no need for standardization for such petty things as these, which do not affect the safety of driving nor the major comforts; but good arrangement of small detail is greatly appreciated by an owner, and is one of the things which does much toward establishing the car's character.

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# Eliminating Deviations of the Airplane Compass

As long as airplanes are flown at moderate altitudes they are usually guided by land bearings. When the sun is shining or when the sky is star-lit at night the heavenly bodies furnish the flyer a means of determining directions. Very frequently, however, it is necessary to fly through and above the clouds, and a compass is then required to guide the machine by.

Unfortunately the magnetic compass is subject to numerous disturbing influences on an airplane. The same as on modern steel ships, its indications are affected by the proximity of considerable masses of magnetic material. This can be corrected by the use of soft iron shields. Another source of disturbance is a slight turn of the machine, causing what is known as the transient error. The compass card, floating on the liquid, is carried around, owing to the viscosity of the liquid, and it takes some time for it to come to rest again.

On an airplane vibrations are generally very strong, and the compass must be protected against this vibration by supporting it on soft cushions and maintaining it in its normal position by light coiled springs.

### Banking a Cause of Disturbance

The most important cause of disturbance is the banking of an airplane in turning. The banking is the greater the shorter the radius of the turn and the higher the speed. It is known that the earth's magnetic field is not parallel to its surface. The inclination of the magnetic lines of force, known as the magnetic dip, varies from point to point. It is the horizontal component of the earth's field of force which normally determines the position of rest of the compass. The vertical component is normal to the card of the compass and has no effect on it. But when the plane is banked and the card of the compass in consequence is no longer horizontal, the vertical component of the earth's magnetism begins to exert an effect on the compass. In fact, the airplane may be so tilted and the direction of the flight be such that the card of the compass is normal to the earth's field of magnetic force at the point, so that all action of this field of force on the compass ceases. It has been calculated that in England this requires a tilt of 23 deg. while flying magnetic east, the angle of 23 deg. being the complement of the magnetic dip.

Some work that has been done with a view to compensating the various disturbances to which the airplane compass is subject was disclosed in a recent paper by S. G. Starling, of the West Ham Technical Institute, read before the Optical Society of England. Mr. Starling collaborated with the firm of Henry Hughes & Sons in an endeavor to produce a compass that would be entirely reliable in airplanes.

### Avoiding Damping Oscillations

One of the problems that arises is that of damping oscillatings set up by any cause. Mr. Starling found that if M is the magnetic moment and I the moment of inertia of the system, H the horizontal terrestrial force, and K a couple due to friction or viscosity, proportional to the angular velocity of the card, the return to rest is oscillatory, dead-beat or quickest according as 4 M I H is greater, smaller or equal to $K^2$. Most compasses are insufficiently damped, i. e., K is too small. To get M as great as possible without increasing the I, he makes his magnets of little steel tubes, filing the ends off obliquely until the inertia and demagnetizing effect of the ends are suitably reduced. The new cards fitted with these floating magnets came to rest in 17 sec. against 47 and more seconds.

Mr. Starling corrects for tilting by the use of two permanent magnets which are fixed symmetrically to the compass, with their north pole pointing down to a tilting lever so that they remain perpendicular to the card when the airplane is tilted. The external field of these magnets is equal and opposite to the vertical component of the terrestrial field. He also attaches soft iron correctors to a tilt measurer which is based on the following principle: The effective weight of a body of mass m carried on the airplane is increased by the centrifugal force when the airplane is banked and becomes $m g / \cos \phi$, where $\phi$ is the angle of the tilt. Therefore, if the body is attached to the center of a spiral flat spring and provided with a pointer, the deflection of the latter measures the tilt. With the aid of this spring the correcting masses of soft iron are approached to the compass as the tilt increases.

### A Special Compass Constructed

In a compensated compass constructed for Mr. Starling, two magnets are pivoted so as to be able to rotate. One end of each magnet is weighted and the magnets are held in the horizontal position by special springs. In banking the increased effective weight of the magnets causes them to tilt into a nearly vertical position and so diminish the magnetic moment of the card. Mr. Starling claims that in this way the error due to banking is nearly eliminated, and when the plane is righted again the magnets resume their horizontal position.

# Automobile Preparedness in Germany and U. S.

## A Comparison of Organization, Resources and Methods

| GERMANY |
|---|
| 1—Motor Trucks Subsidized |
| 2—Truck Standards Developed |
| 3—Automobiles Unsubsidized |
| 4—Parts Not Standardized |
| 5—Materials All Inventoried |
| 6—Fuel Supply a Big Problem |
| 7—Lubricant Needs Underestimated |
| 8—Automobile Engineers Organized |
| 9—Car Owners and Drivers Listed |
| 10—Strategic Roads Constructed |

| UNITED STATES |
|---|
| 1—No Provision for War Trucks |
| 2—Commercial Standardization |
| 3—Millions of Motor Vehicles |
| 4—Parts Development Haphazard |
| 5—Materials Control Needed |
| 6—Fuel Supply Is Assured |
| 7—Lubricant Production Ample |
| 8—S. A. E. Work Invaluable |
| 9—Drivers Lack Army Training |
| 10—No Real Military Highways |

By E. A. Langdon

*EDITOR'S NOTE—An intimate study of conditions in Germany during a long sojourn in that country has enabled Mr. Langdon to form a very clear idea of the relative degrees of preparedness for war, in respect to the important motor vehicle factor, in Germany and the United States. This article was written upon his arrival in Denmark.*

THOROUGHGOING preparation of every national resource, whereby Germany and her allies—who are vastly inferior to her in each respect—have been able to withstand so far the onslaught of most of the forces of the rest of the world, has proven its value beyond the shadow of a doubt; and while the opponents of the Central Powers have been forced, by the law of adaptation, to introduce all devices of "Prussian" efficiency in their military and economic structures; while, on the other hand, the extremest pacifists have come to doubt whether permanent peace can ever be established in the world, the lesson of Germany's preparedness is one that cannot be misunderstood and must not be misconstrued, save at the risk of endangering national life. This applies to every great power, as well as to small ones, every one of whom is now ranged in the trail of some influential nation.

After a study of automobile conditions during the war, the writer desires to put forward his conclusions in as clear a form as possible and to show their application to American conditions. First, the facts are to be summed up; then, drawing comparisons with the possibilities of situations which America some day must face, the requirements of this situation, so far as automobiles are concerned, are to be considered.

### German Automobile Organization

Germany's preparedness, with regard to automobiles, covered two broad fields: materials and men. Materials which enter into the following considerations can be divided into 1—complete automobiles; 2—automobile parts; 3—raw materials, and 4—fuels and lubricants. Class 2 includes accessories.

#### Truck Efficiency Assured

1—AUTOMOBILES. This point was most efficiently taken care of, prior to the war, in respect to trucks. The Imperial Army command had, after thorough investigation of all points required by army trucks, designated certain features as desirable in trucks, and introduced a subsidy law, whereby German-made trucks conforming with these desirable specifications could be bought by the user at a very considerable discount, inasmuch as the Government furnished him with a fair percentage of the truck's price. Of course, the owner thereby became obliged to put his truck at the country's service immediately upon the outbreak of war, being indemnified by the Government at its valuation of the truck for his loss; but as Germans have a practical understanding of history, they knew that if the State needed their trucks it would get them ultimately, and so a very great number of truck users availed themselves of the Government offer. This movement, of course, strengthened the standardization of trucks suitable for army use, and caused the organization of plants which could easily be enlarged if necessary. It also caused a certain degree of standardization in the design of truck parts. As for passenger cars, the subsidy policy was not adopted, very likely for

reasons of finance; but Germany has learned her lesson, in this respect, during the war.

**Inadequate Standardization of Parts**

2—AUTOMOBILE PARTS. Standardization of parts in Germany, before the war, had not progressed as far as in America. There were many reasons; factories had no output comparable to the thousands of cars and part sets produced in America; most factories made every little part of their products; and the German market was not large enough to stimulate the organization of "assembled-car" plants. There was also a wide variation of accessories, each maker adding his individual ideas to fundamental features. The organization of the parts manufacturing interests was even less efficient than that of makers of passenger cars.

**Materials Systematically Handled**

3—RAW MATERIALS. Here the automobile industry, important as it was, represented only one of many German lines of business. As the Government keeps exact records, which are continually corrected, of the distribution of wealth, labor, materials, etc., in the country, this information, together with the German genius for organization, furnished a strong basis for an efficient plan for marshalling these resources when the country required all of them. The Government was in possession of exact up-to-date records of the stocks in Germany of metals, woods, minerals; it knew how much of each of these was made in Germany, and who could work it into whatever finished product was needed. Automobile and part makers simply were among the industrial factors transforming raw materials into finished products; and according to their manufacturing capacity each establishment was allotted a suitable proportion of the national stock of raw materials.

**Fuel Supply Studied for Years**

4—FUELS AND LUBRICANTS. The problem of automobile fuel, fortunately for Germany, had been sufficiently acute for several years preceding the war to attract the full attention of the Government. Not only was Germany, therefore, organized to determine at any time its stock of these materials, but the maximum production obtainable from resources within the reach of the Central Empires was known exactly before the war. It was for this reason that official aid was given in no small measure to the development of a home fuel industry to obviate any danger that might possibly arise from a shortage of oil products; and the history of German gasoline and benzol fuel, since the day when the Standard Oil invasion of the Empire was decisively repulsed, shows with what determination Germany went about the matter of rendering herself as independent as possible of foreign fuel resources. Gasoline and benzol were not the only fuels of the national plan; industrial alcohol, which in Germany is a much more important commodity than in the United States, formed another fuel which it was thought the Germans could produce in practically unlimited quantities. The raw materials for alcohol fuel are potatoes and sawdust, chiefly; and it is on the potato question that the Germans made one of their most serious miscalculations. The demand for potatoes as a food proved much larger during the first twelvemonth of the war than had been anticipated, as the hog stock consumed considerable produce. This resulted in a shortage of fuel which had almost become critical by the time the Germans regained the Austro-Polish oil fields and advanced sufficiently far into Russia to obtain an increase of resources. There can be no doubt but what Germany would have been prevented from carrying out her Balkan and Rumanian campaigns, and consequently from obtaining food from Asia Minor and Mesopotamia, if Mackensen had failed to throw the Russians back when they had advanced as far as Dukla and Uszok (Carpathian campaign, spring of 1915). So much for the paramount importance of fuel resources.

**Engineers and Drivers Listed**

The preparations with regard to men covered primarily a system of full and exact records of automobile engineers and drivers in the Empire. There was, of course, also a list of owners, a great many of whom knew how to drive. Germany possessed, furthermore, a fundamental automobile instruction course in the army, but this had not the present capacity for developing drivers and repair men; nor had the system of rapid and thorough instruction been developed to anywhere near that existing now. The elementary mechanical instruction of troops-to-be, whereby thousands are now being prepared for work with internal-combustion motors, whether on automobiles, aero service or submarines, is now supplying a continually rising number of efficient workers for this kind of machinery.

Finally, it must be remembered that Central Europe, and Germany in particular, is covered with a net of strategic railroads, all of which, with the exception of Rumanian roads, have been constructed with a view to service in the present war. The automobile branch of the army supplements to a great extent this very system of strategic roads. The road question, therefore, is also a most important phase of automobile preparedness.

## United States Preparedness

To come to kindred considerations for the United States, we shall have to take up the viewpoints above considered, and compare the facts to those obtaining in America, in the light of such possible military situations in the United States as presumably would heavily tax the automobile power of the country.

**Highly Standardized Methods**

1—AUTOMOBILE. The "running stock"—to use a quasi-railway term—is very much in excess of that of any European nation, due partly to the manufacturing capacity and the greater buying power of the country, and partly because distances to be covered are greater than in Europe. Therefore, a more than sufficient host of motor vehicles could be drafted by the Government in case of war. A further fortunate circumstance is the fact that thousands of cars are produced by the same plant and can be used in standard manner, whether for carrying men or materials. Other cars are made up of standard-manufactured parts—motors, axles, etc.—and in a way may be considered in the same light. The motor vehicle production of the United States, so far as machine tools and raw materials are concerned, is of more than ample capacity for any American war imaginable within 15 or 20 years. This production, however, is bound to be reduced by the necessity of transforming many car and truck factories into munition plants, as has been the case in Europe and to some extent in America. Nevertheless, it is almost safe to say that the five largest passenger-car manufacturers and the ten leading truck makers (to take round figures) could supply all the needed vehicles, providing America would not have to supply a dozen other countries as she had to in the present war. It stands to reason, however, that if the United States were involved and the war carried to the American continent, the immediate local requirements would first be satisfied and America would not suffer directly from a

lack of vehicles. The question of roads, which is most intimately interwoven with that of vehicles, will be considered afterward.

**Parts and Accessories Neglected**

2—AUTOMOBILE PARTS AND ACCESSORIES. Here standardization has not progressed as far as with automobiles. Everyone is familiar with the enormous number of accessories, for instance, which the market affords, a great many of which, though of merit, are not properly developed because of lack of capital, while many inferior ideas, by sheer weight of early introduction, continue to prosper. The situation is not so bad with automobile parts; still, it could be rendered infinitely better from the point of view of military usefulness. Automobile engineers have not paid one-tenth the attention they should to the question of parts and accessories and a possible remodeling of fundamental constructional ideas toward probable requirements of the future. Unless this state of affairs is corrected in time, the nation will pay dearly for its comfortable outlook. A thorough study of the new forms developed by the war, with the different nations, as well as a logical forecast of what new features the development of the next 10 or 20 years might necessitate, will do much toward making America the absolute controlling power of the world's automobile industry; so that even a high initial expense connected with such work would bear rich fruit ultimately.

**Materials Problem More Serious**

3—RAW MATERIALS. In spite of her rich natural resources, America would find this phase of a war the most difficult. It may be hoped, of course, that these materials will be put at the command of the Government in case of necessity; but seeing that the controlling interests are more, and the Government less, powerful than in Germany, the problem would be so much harder in America than in the Empire. The very least which preparedness in this respect can do is that the Government receive, through incorruptible inspectors with military rank, periodical reports of available stocks and handling capacity of the different companies. With such information in the Government's hands, patriotism would do the rest to render due service to the country.

**Fuel Supply Fairly Safe**

4—FUELS AND LUBRICANTS. The preceding remarks hold good, in a high degree, for these materials. The oil fields, moreover, are so situated that it is difficult to imagine them overrun by an invading enemy; so that with a passable army organization, the supply would be assured. One point to be seriously considered, though, is a classification and possible standardization of lubricating materials by the scientific characteristics; so that, in case of war, the army should receive the most suitable supplies in this regard, also; for if the European war has shown one thing, only the best a country can give is just good enough for keeping an army from being defeated.

There are millions of men in America who can drive a motor vehicle. However, a great many of them are "individualists"—wasteful and inefficient. It is difficult to outline a course for overcoming this difficulty; in all likelihood the proper education toward national efficiency will have to be the work of universal military service, which America without a doubt will have to introduce if the republic is to endure. I have seen Englishmen smile at the word "hustling," and Germans laugh when the conversation turned toward American system; both are convinced that our two virtues are largely imaginary, and that in spite of being live wires, average Americans are far from efficient in working on any modern plan. This may be a hard thing to say; but it *is* a widespread opinion abroad.

**Government Investigation Needed**

As to the work of standardization and development of types useful from a military viewpoint, the Government should find it advantageous to assign to sixty or 100 regular army officers of technical education the task of studying thoroughly the cars, parts and accessories in existence, and to recommend suitable types to the Government's consideration, either for purchase of patents where such exist, or if such a course be deemed undesirable, for a possible subsidy or support in some form or other.

A similar method should enable the Government to become well acquainted with the important facts of raw material stock, as well as fuels and lubricants.

A great deal of the success of this work—which undoubtedly will have to be attempted, and if allowed to fail will fail, to the great detriment of America—will depend on the spirit and ability of such bodies of highly skilled leaders as the Society of Automotive Engineers. The society, by properly co-operating with the Government and the army, can render invaluable services to the country. Just to mention one point in this connection, members of the society should also be connected with the more commercial departments of the manufacture, rather than restrict their activities to the design and construction ends of production.

**Roads Not of Military Type**

We have to consider one more point—viz., roads. The Good Roads movement has made great headway during the last 10 years; but the highways built were constructed from every possible viewpoint except military advantage. Aside from the consideration of the most suitable road-building materials, the matter of connecting important points in the interior with points of potential strategic value near the borders is a burning question. Covering these points of vantage, a number of road lines—supplementing existing railroad connections—commend themselves to the automobile-militarist observer:

Denver—San Antonio.
Denver—El Paso.
Denver—Phœnix.
Denver—Salt Lake City.
Denver—Bismarck.
Denver—Helena.
Salt Lake City—Seattle.
Salt Lake City—San Francisco.

The roads which now cover these lines completely or partially should be connected and reinforced with a view to suitability for military service. To do this properly, Government engineers should, as soon as opportunity affords, study the good and bad roads used during the war in Europe, and conclusions should be drawn, comparing European and American conditions. The construction would have to be carried out with national aims in view and disregarding many local demands and ambitions; it would have to be done, very likely, with Federal resources and labor. But all these points are details.

The purpose of the above considerations is not to lay down a hard and fast plan along which America could advance; but merely to call attention to a number of phases in European and American conditions, to stir ideas which in one form or another exist on both sides of the ocean. Here is, without a doubt, a field for thousands of brains for many years to come; and the sooner the work is begun, the better it will be for America and her automobile industry.

# Tractor Displaces Horse for Hauling Heavy Artillery

## Developments in This Branch Greater Than in Any Other Department—English Employ Creeper—Italians and French Use Tractors—Horses Gradually Disappearing in All Branches of Service

By W. F. Bradley

*Special Representative in Europe of*
THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES

ALTHOUGH heavy guns are not hauled by gasoline tractors exclusively by the Allied armies, the developments in this branch of the service are greater than in any other department, and sufficiently satisfactory results have been obtained to show that future applications must be in the direction of mechanical rather than animal traction. There are many reasons why the change should not be made at once, among them being the difficulty of getting new material in sufficient quantities, and also the time required to train men to handle tractors in a satisfactory manner.

Some attention had been given to artillery haulage by mechanical means before August, 1914, but it needed the war, first to show that the horse was not necessary for this work, and secondly to prove which types of tractors were the most suitable. The period during which the right types of tractors have been available is comparatively short, which explains in a very large measure why animal haulage is still employed. Even among the Allies there is no uniformity in the type of tractor employed. The French have always shown a preference for the four-wheel-drive tractor which they develop, and which is now produced in quantities by Panhard, Renault and Latil. These tractors are bigger and more powerful than those commonly used in America, and are always fitted with a winch, which is indispensable for artillery work.

### Divergence in Methods

The English, who had paid no attention to tractor haulage of guns before the war, and never built four-wheel drivers, have fallen back on the creeper, largely American, and also use the steam tractor to a considerable extent. The French claim that their four-wheel drivers will do all that the creeper can accomplish, and will not destroy roads, for the French tractors are rubber shod.

The Italians, again, have worked on entirely independent lines, and possess three different types of gasoline tractors, the Fiat, the Aratrice, made by Pavesi & Tolotto, and the Soller. Unlike the French, rubber tires are not employed for the driving wheels. The French and Italians are alike in finding no use for steam. The English have always had a weakness for steam, but even in their case greater progress has been made by gasoline. As an indication of the general tendency, the Italians, who hold the front presenting the greatest transport difficulties, make use of gasoline tractors exclusively in the hauling of their heavy guns. No matter what the height or the nature of the country over which they have to pass, the Italian big guns are advanced into Austrian territory behind the gasoline tractors built by the three firms mentioned above.

By heavy artillery is meant guns of 6-in. bore and upward. Below this size, gasoline tractors are used for hauling, but they are nowhere employed to the exclusion of horses. The French, for instance, carry numbers of their 75-mm. guns on special truck chassis, but the problem of applying mechanical traction to all the field batteries does not appear to have been tackled. Obviously, the greatest advantage is increased mobility when the guns are gasoline hauled, and it is for this reason that most of the 75-mm. anti-aircraft batteries are motorized. The Italians have also mounted many high-angle 75-mm. field pieces on chassis built by Itala, for anti-aircraft service.

Although most of the Italian field pieces are horse-hauled, this army makes extensive use of a special truck chassis built by Spa for carrying and firing a special long-range, quick-fire 4-in. gun. This appears to be the biggest gun fired from a truck chassis, as distinct from guns which are hauled by a tractor and fired from their own carriage. Not only is the gun motor-hauled, but the battery is served exclusively by motor. This means that not only the gun and its crews are carried by motor, but all the ammunition and supplies required by a battery are hauled without the use of horses. This is one of the finest examples of modern motorized artillery to be found anywhere in Europe. Actual figures regarding the increase in the number of motor-hauled guns compared with horse-drawn cannon may not be available for publication until the end of the war. This fact, however, is certain, that among the Allies, as well as among the Central Powers, the horse is giving way to the tractor all along the line, and is liable to disappear for everything but the haulage of the lighter field pieces. There is no divergence of view on this point. Yet there is a great variety of opinion on the value of the respective types. Germany's conceptions are entirely different from those of the Allies, while among the Allies themselves natural characteristics are shown in the types of tractors adopted.

### Two Haulage Plans

In planning the haulage of guns of 155, 280, and 305 mm., there are two general plans. Some armies consider it necessary for each gun to have its own tractor. When the gun is in position the tractor is idle, and the men in charge of the tractor have nothing more to do than keep it in condition ready for emergencies. Under this system the tractor is more often hidden under a tarpaulin and the branches of trees than doing work on the road, for even if the gun has several emplacements, and changes its position at frequent intervals, so as to deceive the enemy, it cannot be engaged in hauling more than a fraction of its time. The advantage of this sys-

tem is that the tractor is immediately available when the order is given to advance or retreat. For instance, when the Germans withdrew from their positions on the Somme and the Aisne, in March of this year, the system of a tractor for each gun was valuable, for it allowed the Allies to follow up with their heavy artillery without any delay.

Under the second system, fleets of tractors are kept in partial independence of the batteries, performing all kinds of work, but ready to move the batteries to a designated position at an appointed time. There is a loose analogy with tugs and ocean-going steamers. The tug does not lie idle while the steamer is in dock or at sea, nor does the tractor go into retirement after placing a big gun in a position from which it may not have to be moved for a month. The second plan is the more economical, but whether it is the more satisfactory will depend on the nature of the country and the kind of warfare being conducted. If a vigorous offensive is contemplated, there ought to be a tractor per gun. Acting on the defensive, or in a difficult mountain country, where rapid advance is impossible, the group system of tractors is quite satisfactory.

**Transfer of Guns at Night**

The battery commander having received instructions to move from one set of emplacements to another, or to transfer to another section of the front, arrangements are made with the tractors to pick up the battery at an appointed time. In most cases the actual work of removal has to be done in darkness, for even if the roads are free from direct observation, airplanes naturally would be interested in noting the general direction of the guns, and, if possible, locating their positions. When the immediate vicinity of the front has been left behind, and daylight haulage can be undertaken, it is a wise if not elementary precaution to cover the vehicles with branches of trees so that they cannot be distinguished at the height of 6000 to 9000 ft., at which most airplane observations are now carried out. It is obvious that teams of horses hauling 10-ton loads are very much more difficult to disguise than tractors.

A very common practice when a gun position has to be changed is to occupy 2 nights on the work. On the first night the various materials connected with the battery are moved, and on the second night the gun itself follows. In this way the gun can be in position and firing until within an hour of its removal, and can be firing from another position a few hours later. It is but a detail in the art of keeping the enemy guessing.

**12 Tractors for 2 Guns**

Two guns of say 280-mm. bore, together with all their equipment, will require the services of twelve tractors, each one capable of hauling a maximum of 20 tons. In this case each tractor would haul two trailers, and, counting an average length of 65 ft. for the three vehicles, the total length of the procession when on the move would not be much less than half a mile; even closed up as close as possible, for a roadside halt, the length would be from 300 to 400 yards. Such a procession needs careful handling on the road both to avoid traffic congestion and to prevent its being spotted by whatever enemy airplanes may fly across the lines.

A single gun of 280 mm. bore, together with its special foundation, will form a sufficient load for any single tractor. A gun of this size weighs approximately 10 tons; allowing 7 to 8 tons for the second trailer carrying the gun platform, gives a total of about 18 tons in tow, which is about as big a load as can conveniently be handled over give-and-take roads. One of the finest mechanical sights in connection with the war is the removal of two or three big guns, together with their crews and equipment. Take for instance two 280 mm. guns hauled by Fiat tractors. They arrive in some wrecked and deserted village behind the lines during the afternoon, and are immediately parked in an open space by the side of a ruined church. Each vehicle is partially hidden under branches of trees, but as soon as the convoy comes to a stop the crews go out and cut down more branches which form such a covering that even the most expert airplane observer would have difficulty in recognizing anything but foliage.

**Activity at Daylight**

It is intended that this battery shall move up in support of the advancing infantry, but progress from this point is impossible until darkness has fallen. The convoy is therefore abandoned to the care of those men appointed for guard duty and the military police who happen to be on duty at that particular point. As soon as daylight has disappeared there is activity. A few orders are given, motors are cranked, a touring car containing officers moves away in the darkness, and within 5 min. the first tractor has passed out of the square onto the dark roads. With no other noise than the rattle of chains and the crunching of wheels, the tractors move away with their loads until in less than 20 min. the square is deserted of everything but numerous branches of trees and a motorcyclist whose duty it is to close the procession.

The first tractor in the big convoy has in tow one of the guns running on its own wheels and a special trailer carrying a wood and iron platform for the gun. The second tractor has in tow the fore-carriage of the gun and a trailer loaded with material. The third, fourth, fifth and sixth each has two trailers with all kinds of material or the battery crew. The seventh tractor hauls the second gun, while the following tractors have loads duplicating those in the first portion of the convoy.

On a good open road the average speed of this convoy is 7 m p.h., the maximum being 9 m.p.h. At various points, however, the speed is cut down to 3 m.p.h. or less. Many of the bridges, particularly those in captured territory, are only built for light loads. As the tractor itself weighs about 8 tons, the gun 10, and the second trailer 7 or 8 tons, it will not be possible to get all three over at once. Thus on the bridge being reached the tractor drops its load, crosses the bridge alone but unwinds its tow rope as it goes, then by means of its winch hauls first the gun and later the second trailer. Having picked up its load, it moves away, and the second tractor goes through the same operation. If the bridge has been divided down the center to give separate tracks for in and out traffic, as is frequently the case, it is quite likely that other traffic will be stopped and both tracks will be made use of. Thus no sooner has a trailer got off the right-hand side of the bridge than another enters the left-hand side, there never being more than one vehicle on the bridge at a time, but also no break in traffic. Probably this operation has to be carried out in darkness, or with very reduced lights, thus calling for very skilled handling on the part of officers and crew.

**Teamwork in Placing Guns**

As the guns reach the emplacement selected for them, more good team work has to be displayed. In all probability the new position is within the vicinity of a made road; but it is never on or close by the side of a made road, nor must there be tracks between the road and the actual gun position. Modern aerial photography has reached such a degree of perfection that it can often differentiate between a real and a sham road. In the final

placing of the gun the winch with which all these tractors are fitted plays an important rôle. It is also desirable and necessary that the tractor should be able to advance over broken country so as to assist the crew in the placing of the gun.

**Three Italian Types**

All three types of tractors used by the Italian army were in existence before the war. While the war has not been responsible for their creation, it has had much to do with their development, for they have grown with the ever-increasing demand for more and more heavy artillery. Although entirely different types, the Fiat and the Aratrice appear to enjoy an equal degree of favor. The Soller, believed to be either a Swiss or a German invention, is an entirely different class and used in comparatively small numbers. This tractor has a single cylinder horizontal motor with double opposed pistons, the combustion chamber being between the two pistons. Although the motor is under a bonnet, there is no radiator, the cooling water being in a tank within the chassis. There are six speeds and reverse, the lowest speed giving about 500 yd. an hour and the highest 8 miles. Final drive is by side chains; both front and rear wheels are cast steel without rubber tires. Although used principally for hauling, this vehicle has a platform body capable of accommodating an 8-ton load.

The Fiat tractor, which was developed before the war with the primary object of hauling heavy artillery, has a four-cylinder pair-cast motor of 5.1 by 7.8 in. bore and stroke. Except in the pair casting of its cylinders its general design does not differ from the ordinary Fiat truck motor. A governor limits the motor speed to 1300 revolutions and the half-compression device automatically retards the ignition, which is by high-tension magneto with fixed advance when running. The gearset provides four speeds and reverse, with final drive by side chains contained in solid housings forming radius rods. At the rear of the chassis there is a horizontal winch with a ⅝-in. steel cable about 160 ft. in length. A powerful differential lock is fitted, and the brakes, which are all water-cooled, are so designed that the retarding force can be applied to one wheel independently of the other, this being for use on mountain roads with very sharp curves.

The front wheels are cast steel with rubber tires of 6.3 in. sections. At the rear are 48-in. wheels of 7-in. face with herring-bone ribs to give greater adherence. But the special feature of these tractors is the use of a segmental steel band placed around the wheel so as to increase the area in contact with the road and permit traveling in soft and broken ground. There is a very clever arrangement for carrying these bands, when not in use on the driving wheels, on the top of a special fender above the wheel. There are two small winches, one at each end of the fender, for hauling these bands in either direction when being put on or taken off the wheel.

**Two Types of Tractors**

There are two different types of these tractors, one having the motor under a hood and the other under the driver's feet. This alters the platform dimensions, but chassis features are the same. The useful load carried on the platform is 5 and 6 tons; the unloaded weight of the tractor is nearly 7½ tons, and the maximum load it can haul over a level macadam road is 100 tons. In actual service, however, it is not often that the tractors are called upon to haul a load of more than 25 tons. When such a load is picked up, it is almost general practice to fit the driving bands, for the sides of the roads are soft, and it would be impossible to pull out without them. Men who handle these tractors speak in the highest terms of the work they can perform. This enthusiasm does not appear to be misplaced, for these tractors are working on all kinds of roads and country, at all levels, and never seem to have any difficulty in taking the guns to the positions selected.

Although doing the same class of work as the Fiat, the Aratrice tractor, for which the engineers Pavesi & Tolotti are responsible, is of an entirely different conception. It is a low-built tractor with 40-in. driving wheels, weighing only 5 tons complete, driven by a slow-speed four-cylinder motor of 5.1 by 7.08 in. bore and stroke. Smaller models are made, but this type is the most extensively used for artillery haulage. Until a short time ago these tractors were made with only two speeds, the lower one giving 1.8 m.p.h. and the higher 3.7 m.p.h. The latest model has a four-speed gearbox giving road speeds from 1.07 to 6.2 m.p.h. The rear wheel diameter has been increased to 47 in., and the platform designed to carry a 3-ton load. In each case final drive is by means of inclosed side chains.

**Designed for Work on Roads**

The Fiat may be classed with the French four-wheel drivers as an excellent tractor for artillery and other heavy haulage where roads exist. They are capable of working on very poor roads, and even on no roads at all; nevertheless their designers appeared to have in view the fact that nearly all their work would be done on made roads.

The Aratrice, on the other hand, could almost be classed with the creeper, for it is a tractor which has been developed with agricultural conditions prominently in view; in other words, for doing most of its work on broken ground. The two have their respective spheres of usefulness. The Fiat type would haul guns over good roads at a higher speed than the Aratrice; this latter would take guns into positions that the Fiat type would have difficulty in approaching. It is almost entirely a question of deciding which set of conditions will predominate. If good roads are likely to be available all the time, a vehicle which cannot exceed either 4 or 6 m.p.h. will be at a disadvantage compared with one capable of hauling the same load at 8 m.p.h.

The Aratrice tractor has a centrally pivoted front axle, thus giving a three-point suspension of the entire vehicle. The driving wheels are a patented type, each one having twelve mobile steel shoes operated by an eccentric and connecting-rods so that each shoe attacks the ground at the correct angle. On the purely agricultural machine, which undoubtedly will pass over any kind of ground that can be plowed, these ribbed shoes are replaced by a special type with projecting forked paddles. It is claimed that with this type of wheel a tractor weighing only 5 tons complete obtains adherence equal to that of a tractor weighing 12 tons. The military tractors are supplied with the agricultural type of wheel with the projecting forks, but experience at the front shows that conditions are rarely sufficiently strenuous to call for their use.

**Winding Drums Needed**

No tractor is complete for war service unless it possesses a powerful winding drum. The Aratrice not only possesses this drum, but has a demountable crane, the head of which is 20 ft. from the ground, designed to be readily attached to the front portion of the chassis. The crane will lift a load of 5 tons, thus it is capable of picking up an empty tractor and moving away with it. This fitment is remarkably valuable for work at the front. The uses which most readily suggest themselves are acci-

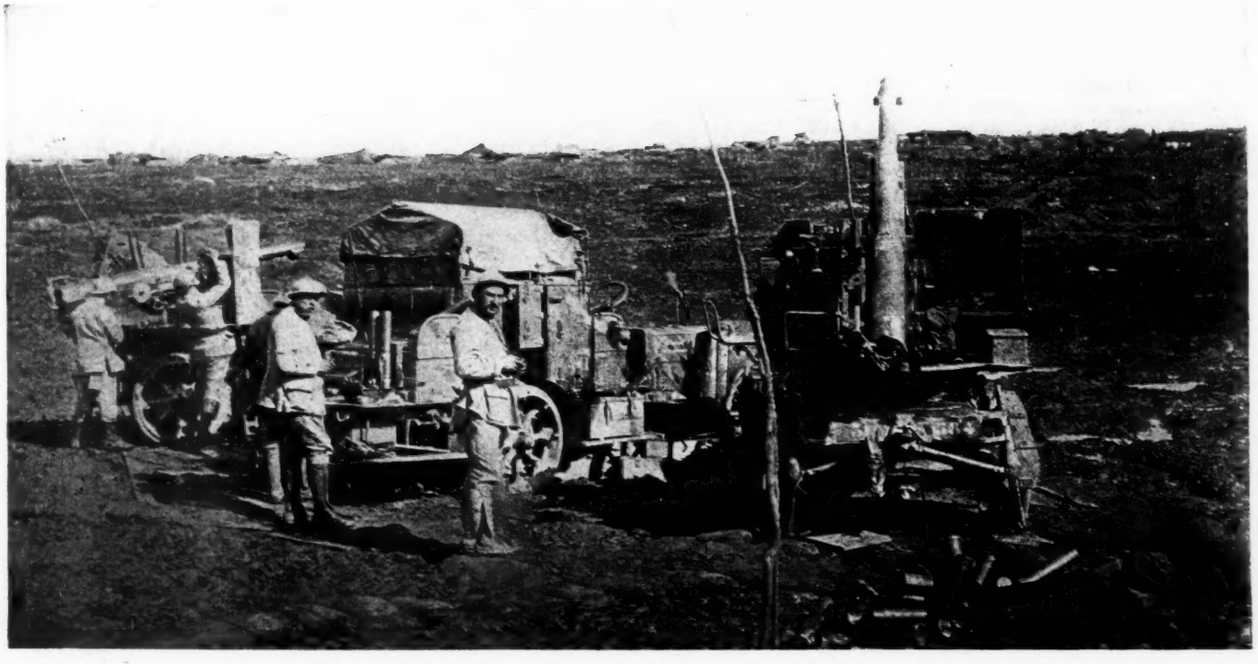
(*Continued on page* 481)

# Motor Trucks on the French Front

Above—Convoy of Pierce-Arrow trucks moving over recently captured territory in France

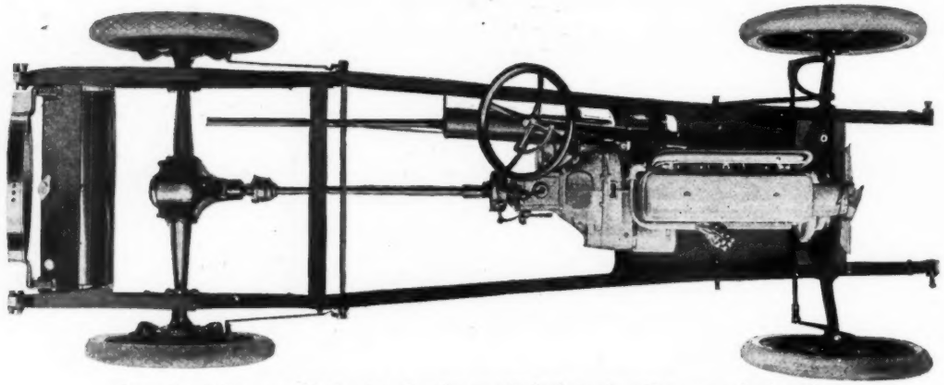
Center—One of the automobile kitchens attached to every army convoy. The soldiers are preparing the evening meal

Below — Anti-aircraft automobile 75's in action. Cars are special eight-cylinder De Dion Boutons



# Nash Six An Entire New Design

## Engine Especially Suited for Low-Grade Fuel—Duplex Hot Air Control on Carbureter Partly Automatic—Built Throughout in Nash Plant



Chassis of the new Nash six, showing neat design of unit power plant and general layout. Note transmission hand brake

THE outstanding characteristic of the Nash six, made by the Nash Motors Co., Kenosha, Wis., in an engine which embodies the most modern ideas. The piston displacement is 249 cu. in., the dimensions being 3¼ by 5 in., and a maximum brake horsepower of 67 is claimed. This is equivalent to nearly 0.27 hp. per cu. in., which ranks high among the present day engines.

The overhead valve construction is unconventional to the extent that cushion springs are employed direct upon the rockers, as can be seen in the illustrations. The greatest departure from the usual in the design of the motor is that there is only one pair of gears, those for driving the camshaft. This is possible because the Delco generator is made into a unit with the fan, and is mounted on the front end of the cylinder block where it is driven by a V belt. In the middle of the camshaft there is a pair of skew gears driving a shaft inclined at a slight angle to the vertical. On the upper and outer end of this shaft is the Delco timer-distributer, and on the lower end is the oil pump. The water pump attaches to the front end of the crankcase and is driven direct from the end of the camshaft.

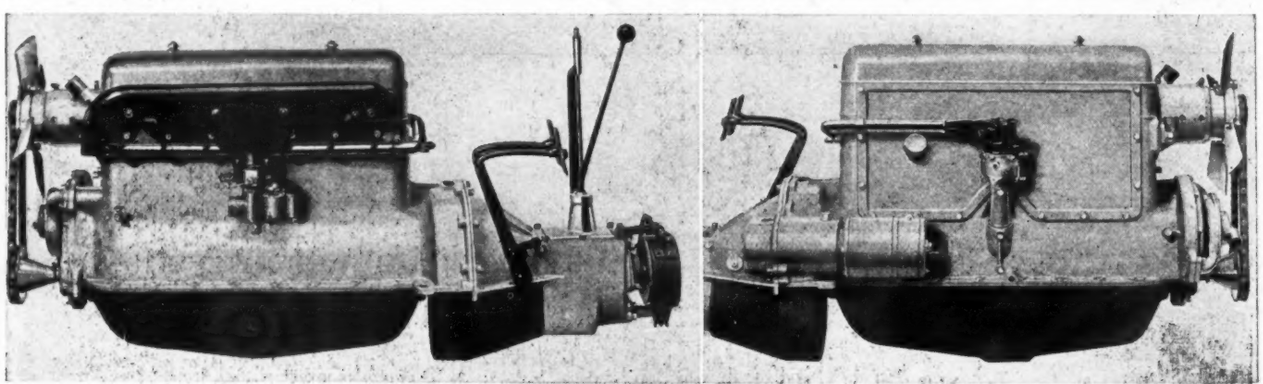
There is no visible breather. The push rods for the valves are inclosed in a large space at the side of the cylinder block which is open top and bottom, so being filled with oil spray from the crankcase, and to provide the necessary outlet to the atmosphere the top cover over the valves is extended over the side of the cylinder block and there pierced with holes. Another point of unusual design is the mounting of the tappets, which are attached to the cylinder block in two assemblies of six tappets each. This should be a real manufacturing advantage. It will be noticed in the sectional view of the engine that the mushroom tappets are hollow.

The form of crankshaft is also shown in the illustration; the diameter is 2¼ in. and the bearing lengths 2¾, 2¾ and 3¼ in., respectively. The crankpins are of 2¼ in. diameter and 2¼ in. long. Pistons are 3½ in. long with 15/16-in. wristpins.

### Intake at High Temperature

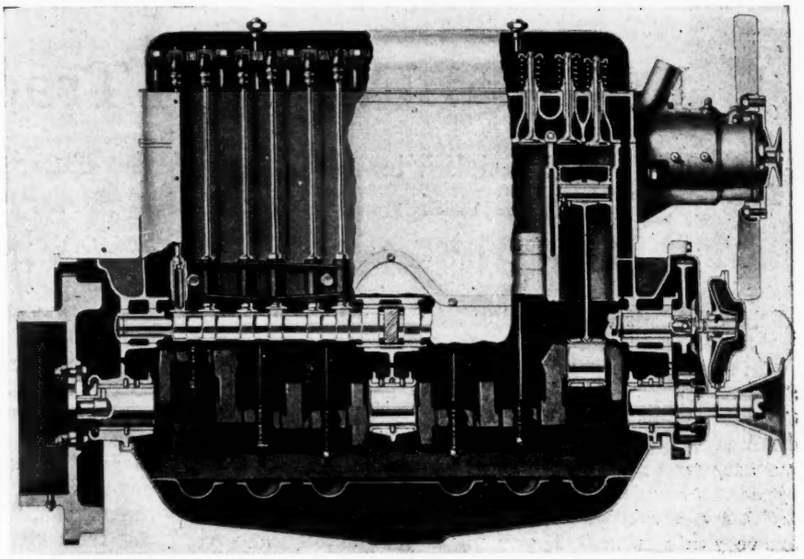
The whole of the intake manifold is kept at high temperature by being located directly under and in contact with the exhaust manifold, in addition to which there is a double heat control on the carbureter itself. Around the carbureter body is a jacket which can be supplied with exhaust gas through a small pipe, and in the pipe, close to the carbureter, is a valve interconnected with the throttle. Closing the throttle opens the valve and admits exhaust heat to the jacket, thus giving additional warming at the time when it is most required. There is a conventional hot air pipe supplying the carbureter, and this has a dash control for giving cold air or hot as required. The exhaust pipe is carried down at the front end of the engine so as to keep heat away from the driver as much as possible. Fuel feed is by Stewart vacuum tank situated under the cowl, where it is concealed, although it is so clipped in place that it can be detached easily. All the connections are in front of the dash and accessible upon lifting the hood.

Another point which should be noticed in the engine de-



Both sides of the engine on the Nash six, showing the belt drive for generator and fan, also mounting of carbureter and distributer

sign is the way in which the valves are accommodated by making the whole of the combustion space in the cylinders, the under side of the head being flat. The upper part of the bore is enlarged but the cylindrical form is maintained. It will be observed that this allows for a small water space between adjacent cylinders, but does not permit water to entirely surround each combustion space. This is of no importance, however, since the object of complete jacketing is to cool the piston and the part of the cylinder in which this lies is well below the level of the cooling water.



Part section through new Nash six engine which is 3¼ by 5 with a piston displacement of 249 cu. in.

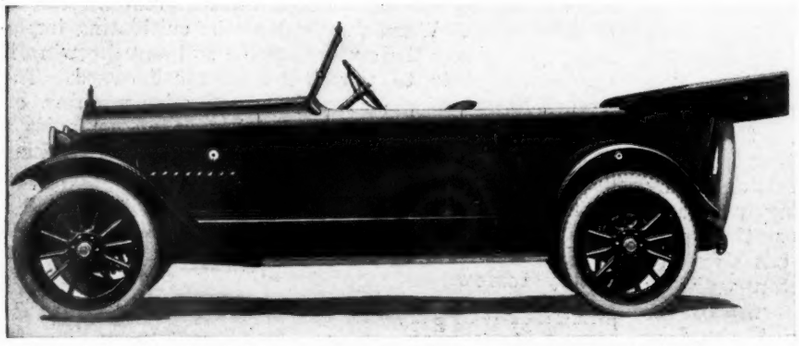
### Single Disk Clutch

A single disk clutch is used and is entirely inclosed. There is no bell housing in the usual sense of the term, but the transmission bolts up bell housing fashion against the upper half circle of the flywheel housing, the lower half of the wheel and the clutch being covered by a pressed steel case. The transmission gives three speeds and carries an external brake, connected to the hand lever. Gear ratios are 4.5, 8.2 and 14.6 to 1, with 19.5 to 1 reverse.

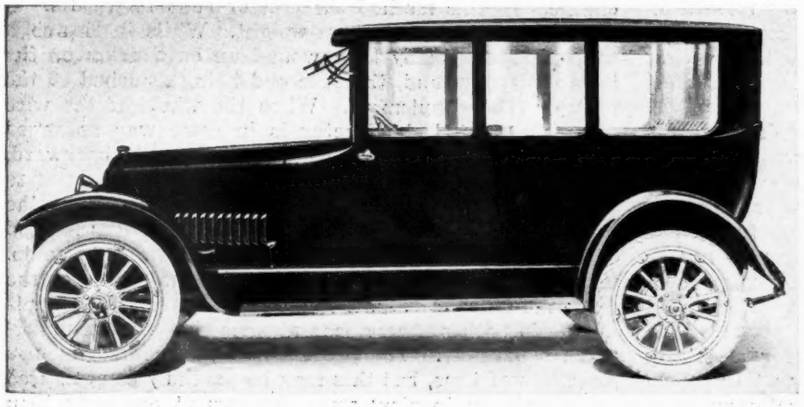
The semi-floating principle is used for the rear axle, which has a malleable center case and conical steel sleeves. A large rear cover on the axle case gives access to the drive gears and differential. Springs are half elliptic all round, those at the rear being 56 in. by 2½ in. with ten leaves; Hotchkiss drive is used. The rear axle and the universal joints are both of Nash design and manufacture. The service brakes are on the axle drums and are contracting, 13 by 2 in.

The frame is taper, but the rear and front portions are parallel, a bend being made in the side rail at the point of attachment of the front hangers for the rear springs and at the dashboard line. This gives a frame of maximum width, so preventing body overhang as much as possible, and this is thought to be of importance in minimizing the tendency for body squeaks to develop. There are only three cross members, one at the extreme front, one under the rear end of the engine and another at the extreme rear of the frame, the gas tank and tire carrier being attached to the latter.

With the announcement of its models for 1918 the Nash Motors Co. discontinues the name Jeffery and henceforth the product of this factory will carry the name Nash. There will be three body styles on the new chassis, a five-passenger touring and a four-passenger roadster on a 121-in. wheelbase and a Springfield sedan on a 127-in. chassis that differs from the shorter chassis only in length. As the seven-passenger member of the line, the old Jeffery six will be continued, but will carry the Nash name-plate. The Jeffery four is discontinued. The price of the five-passenger touring car or the four-passenger roadster is $1,295, and of the sedan, $1,985. The finish will be Nash blue, penciled in gold.



Nash model 6-71 seven-passenger touring car which sells at $1,465



Springfield sedan mounted on the new Nash six chassis with 127-in. wheelbase as compared with 121 in. for touring car and roadster. The sedan sells for $1,985

The seats are especially roomy and doors are wide, the rear seat of the touring model measuring 47 in. Upholstery is deep, of black leather and buttonless. In both the four and five-passenger jobs the side curtains open with the doors and the fastenings of the curtains are of an improved design. Tires are straight side detachable, 34 by 4, plain in front and non-skid in rear and the wheels are artillery type.

The gasoline tank is steel and mounted at the rear of the frame. It has a capacity of 17½ gal.

Equipment is conventional consisting, on the two new chassis models, of rain-vision slanting windshield; foot rest in tonneau; extra rim and carrier; complete set of tools; electric horn; headlights equipped with small bulbs for dimming; a specially designed one-man top anchoring to the windshield; electrically-lighted instrument board carrying speedometer, ignition and lighting switch, carbureter adjusting devices, oil indicator and clock. There are also robe straps and the side curtains are arranged to open with the doors.

# Debated Points in Tractor Practice

## A British View of Some of the Fundamental Subjects of Discussion—French Using Rotary Plows—Trouble in Getting Sufficient Traction on Hilly Ground

CONDITIONS of farming in Europe, and especially in England, are less favorable to the tractor than those which prevail in most parts of the United States. Small fields, often on considerable slopes, are the rule, while the average humidity of the soil is another trouble. In a recent issue of *The Motor*, London, an anonymous author takes up several points which appear to be of special importance to the British farmer, and his views on wheel dimensions and traction generally are very interesting. Regarding wheel diameter, he says:

"The large wheel not only distributes the weight carried over a larger area, and so avoids undue consolidation of the ground, but also enables an engine of given power to do appreciably more work. Any wheel, when passing over soft soil, must necessarily sink in to some extent. Having done so, it must climb out of the depression that it has made. The steeper the hill that it has created for itself the greater the power required. It is, of course, obvious that the pit dug by a small wheel has a much steeper incline than that formed by a larger wheel. The chain track is, in effect, from this point of view, a wheel of almost infinite diameter, since the part of it in contact with the ground is almost a straight line. This is really at the bottom of all the advantages of the chain track method, which are very considerable.

### Tractive Grip a Problem

"Tractive grip is one of the most difficult branches of the whole subject. We want a farm tractor to be so light as not to consolidate the soil and not to require too much power. It is very difficult to combine lightness with an ability to exert a strong pull on a soft or greasy surface. There are several ways of tackling this problem. The fitting of spikes, studs, or strakes on the treads of the driving wheels helps to decrease, but does not necessarily cure, the evil. I have seen tractors with big wheels fitted with both studs and strakes entirely incapable of plowing a decent furrow on a hill the surface of which had been very recently manured. The spikes merely cut a groove in the ground, and the strakes clogged themselves up with manure, and thus formed on the surface of the wheels a kind of tire consisting of lubricant, and so made matters worse rather than better. The result was that when the tractors began to feel the pull of the plow their front wheels went up in the air and their back wheels spun around and dug pits for themselves, which was the only form of plowing achieved. My personal opinion is that tractor makers have not given nearly enough attention to the proper shaping of strakes intended to secure adhesion. Some forms are much better than others, and the intending purchaser ought to take every possible opportunity of noting comparative performances from this point of view.

"There is another point which he should notice at the same time. This is the means provided for attaching and detaching the strakes or other fittings. On some machines, the removal of a set of strakes occupies a couple of men for the best part of half an hour. On others, the work can be done by one man in a few minutes. In England, fields are very small, and roads are surfaced with macadam. A field is perhaps plowed in two or three hours, after which the tractor has to go out on to the hard road and travel along until it reaches the gate of the next field. If the strakes are left in position the use of the tractor on the road is altogether illegal. If any damage is done to the road the tractor owner will certainly have to pay, and even if he escapes observation while breaking the law the process of jumping from strake to strake on a hard surface is very bad for the strakes themselves and also for the wheels and the mechanism of the tractor. It ought to be possible to fit or remove the strakes merely by slackening, and not taking off, a very few nuts placed in quite accessible positions; and I should strongly advise every British farmer who is thinking of buying a tractor to have a good look at these fittings and insist on seeing how long it takes an unskilled man to take them off and put them on again.

### French Use Rotary Plows

"There are other ways of tackling this problem of adhesion. One is to substitute rotary cultivation implements for the ordinary type of plow, and to drive these implements, as well as the rear wheels, from the engine of the tractor. When this is done the cultivating implements, in forcing their way into the soil and throwing it up, actually help to propel the tractor forward. The French have produced several very effective machines on these lines, and at least one British design embodies a somewhat similar idea, employing plow irons working diagonally from the sides to the back of the tractor on endless chains. The plowing done by this method is not pretty in the eyes of the average farmer, but it may well be that it is just as effective as the more regular and sightly furrow.

### Plowing by Wire Rope

"Yet another plan of French origin is to use the tractor in rather the same sort of way as the old plowing engine. In this method the tractor runs forward without any load except its own weight. While it does so, a wire rope, ordinarily kept wound up on a drum on the tractor, is unwound, the free end being attached to the plow or other implement. When the whole of the wire rope is unwound the tractor is in some way spragged or secured to prevent its being pulled bodily backward, and the power of its engine is applied to the drum to wind up the wire rope again, and in so doing to pull the implement across the field. The principle of this method is really the following: The tractor has two jobs to do. One is to move itself backward and forward across the field; the other is to move the plow. Instead of attempting to do both of these jobs at once the two are undertaken separately. The process must, of course, involve some loss of time, but this may be partially compensated by the ability to plow more furrows at one time than would be possible if the tractor had to move itself at the same time as the implement.

"In discussing various systems of plowing, running the tractor with one wheel in the furrow has considerable bearing on the problem of getting a grip. When the surface is very greasy, or has been recently manured, the conditions are extremely unfavorable for a machine running with its wheels on the unplowed land. When one furrow has been turned, however, we have got down several inches below the surface and reached ground which is probably not greasy, and certainly has no manure on it. If now we put our driving wheel down on to this newly-made surface it has a much better chance of getting a good grip. This is not merely theory, but can be easily tested and proved in practice. If, however, there are two driving wheels and a differential, it must evidently be possible to lock the differential gear, as otherwise the tractor may be unable to work owing to the difference of conditions under the two driving wheels.

**Should Wheel Be in Furrow?**

"In this matter of plowing with one wheel in the furrow, there is a possibility which I think ought to be taken into account, though only expert agriculturists are qualified to adjudicate upon it. While it is bad to consolidate the surface of the ground, it is conceivable that the result of consolidating the ground at the bottom of the furrow may be even worse. One would imagine that if plowing were followed by wet weather the tracks at the bases of the furrows where the wheels have pressed the soil firmly down would form little water courses, which, for all I know, might have a very injurious effect. This is not a point on which the engineer can attempt to advise the farmer. On the other hand, it is a point in connection with which the expert opinion of the farmer would be very useful to the designing engineer. Up to the present, however, though I have made many inquiries, I have not been able to ascertain that farming experts have any exact knowledge as to the possible effects of wheel pressure below the level of the furrow.

"As to the engine power that a tractor ought to have, my own impression is that the minimum is automatically fixed by the desirability of being able to drive a full-sized threshing machine with grain elevator. Further, that the nearer one can get to the minimum without taking any risk of dropping below it, the better, because the larger and more powerful one makes the machine the heavier and more unwieldy does it become.

"As to the number of speeds, I consider that there never ought to be fewer than two, one for plowing in stiff soil and the other for lighter plowing and for drawing other implements. If the tractor is also to be used for haulage of loaded wagons upon the road then a third speed is wanted. This should correspond to about five or six miles an hour as against about two miles an hour for the plowing speed. Then, again, if the tractor is to be used for haulage, the system of springs must be efficient. An unsprung tractor on steel tires will soon knock itself to pieces on hard roads unless driven at ridiculously low speeds.

"As regards the number of wheels, personally I favor four, provided that the two steering wheels and their fore-carriage are carried on a single central pivot, so that in effect the frame of the tractor is suspended at three points only.

**Even Torque Desirable**

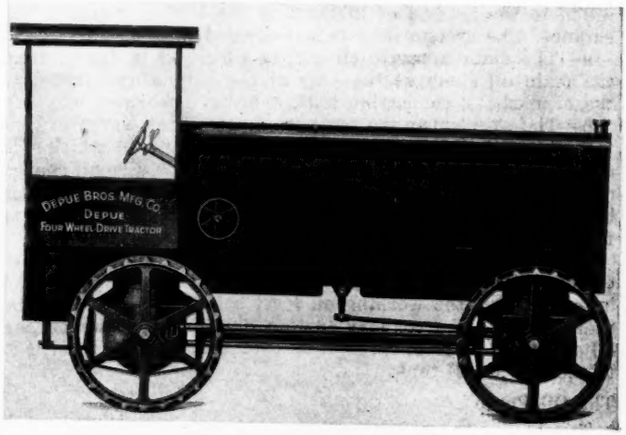
"Finally, reverting to the engine, I think the tendency will be in the direction of motor-car practice. A somewhat slow-running engine, with only one, or at most two, cylinders does not exert a very steady torque. A machine so fitted tends to progress by means of a series of jerks. The frame and the whole of the mechanism are in a constant state of vibration, and every jerk constitutes a fresh inducement to the wheels to begin slipping. The pull of the tractor upon the plow is always more or less oblique, and any factor which tends to unsettle the steady rolling adhesion of the wheels is liable to cause slipping, either in the form of rotation without progression, or in the form of side-slip."

# Depue Is Four-Wheel-Drive Tractor Design

DEPUE BROS. MFG. CO., now located at Moville, Iowa, but which has made arrangements to open a factory at Clinton, Iowa, has developed a tractor for all farm purposes and road work, in which the power is applied to all four road wheels. The drive is by bevel gears, the gear rings being secured to heavy type differentials on the axle assemblies. By running all gears in oil and using roller bearings throughout a relatively high transmission efficiency is obtained and a maximum of power delivered at the drawbar. All working parts are inclosed and protected from dust and dirt.

For the present, the Depue tractor is to be built in one size only. It will be equipped with a model A 20-35-hp. Buda engine, a Dixie high-tension magneto, Pierce governor, Stromberg carbureter and Borg & Beck dry plate clutch, and will be fitted with Timken roller bearings throughout. The transmission is of the company's own design and gives a direct drive on all three forward speeds, there being only two gears in mesh. The front and rear axle housings also are of special design and are fitted with standard heavy-duty differentials. It is not necessary to dismount the axle assembly in order to remove the axle shafts. Another outstanding feature is that all parts of the front axle are interchangeable with those of the rear axle.

Steering is effected by means of a worm gear mechanism which connects to all four wheels. Both axles are pivoted at their center and provided with patented bolsters, which construction permits of turning the tractor in a circle of 16 ft. diameter. The drive wheels are 40 in. in diameter and have 10-in. tires. The wheelbase is 100 in., the overall length, 140 in., and the weight approximately 4500 lb. Speeds from 1½ to 5 m.p.h. are obtainable, the transmission affording three forward speeds and one reverse. The belt pulley can be rotated at 150 to 800 r.p.m., this latter speed corresponding to a belt speed of 3000 ft. p. m. A heavy channel steel frame is used, the frame channels being 7 in. deep. Three-point suspension in conjunction with a special patented oscillating bolster bearing in front is claimed to give absolute flexibility in going over rough ground. Provision is made for burning either gasoline or kerosene.




Depue four-wheel-drive tractor

# The 260-Hp. Mercedes Engine

Part II

## A Detailed Technical Description of the Latest Type of German Aircraft Engine Furnished by the British War Office and Based on Data Obtained from a Captured Gotha Warplane

THE very clean design of the crankcase is evident from the illustrations, and, furthermore, it is of very light section considering the size of the engine, the average thickness of the walls of the casing being 6 mm. The top and bottom halves are bolted together in the usual way by twenty-six 10 mm. hollow bolts through the flange on the center level of the crankshaft.

As already mentioned, the crankshaft main bearing caps are cast as part of the bottom half of the crank chamber, and the long 20 mm. bolts which secure the bearing caps at the bottom pass through the top half of the crankcase and act as the holding-down bolts for the cylinders, which are held in position by triangular bridge clamps. The bottom ends of the cylinder barrels extend past the base flanges, registering into the top of the crankcase, and the holding-down bolts clamp each cylinder base flange at four points by the bridge pieces, or dogs, arranged between each pair of cylinders.

Below the crank chamber at the rear end is situated the main oil sump, which contains the oil pump, and in the front end of the base chamber casting below the false bottom is an auxiliary service oil sump, into which the return oil from the circulation system drains through a wire gauze filter.

The center portion of the base chamber casting, between the two sumps, forms an air chamber for the dual purpose of cooling the oil and warming the air supplied to the intake of the carbureter. Exterior air is led by two ventilating funnels on each side of the crankcase into two oval ports in the base chamber casting, and a number of fins are cast on the underside of the false bottom inside the base chamber for cooling purposes.

The air intake to the carbureter is 4 in. in diameter, and it is cast in the left-hand side of the crank chamber and base, as shown in the general arrangement drawings of the engine. Cooling fins are also cast on the underside of the sump, and four breathers are fitted into the top half of the crank chamber between the webs of the main bearing housings.

### Lubrication

Although the general lubrication system of the engine is arranged on normal principles, it appears advisable to deal with the various details of the somewhat complicated plunger type oil pump, and to describe their different functions in relation to the method of lubricating the various parts of the engine. The system may be sub-divided into three circuits:

a—The main pressure circuit, in which oil is drawn from the main oil sump at the rear of the engine and forced to the crankshaft, connecting-rods, camshaft bearings, etc.

b—The supplementary pressure system that works in conjunction with the main high pressure system, in which two auxiliary plungers of the main oil pump draw a small charge of fresh oil from the service oil tank at every stroke, and thus keep the main circulation supplied with a certain quantity of fresh oil.

c—A suction "scavenging" circuit, which supplies the main oil sump from the auxiliary drain sump at the front of the base chamber, the working oil level being maintained in the rear sump by a secondary suction pump that draws off the oil above the oil level through an overflow pipe and returns it to the service oil tank.

### The Oil Pump

Two main plungers for suction and delivery are employed, while three auxiliary plungers are suspended from one of the main pump plungers; these work in conjunction with piston valve plungers at the sides of the main pump.

Each pump and valve plunger is operated by an eccentric, and the eccentric spindle is arranged transversely to the engine crankshaft; it is driven by worm gear from a layshaft at a 17 to 1 ratio to engine speed. The layshaft is driven by bevel gearing from the vertical driving-shaft of the water pump, this being in turn driven from the main bevel gear pinion on the rear end of the crankshaft, as shown in the general arrangement drawing of the engine, Fig. 3.

The functioning of the oil pump will perhaps best be grasped by reference to the diagrammatic section, Fig. 11, and, considering first the main pressure system of lubrication to the main bearings, its action is as follows: Oil is drawn from the main sump through the wire gauze filter in the bottom of the oil pump body by the suction of the main plunger pump A through the port B (which is cut in the bottom of the pump barrel), in conjunction with the piston valve C, when the latter is in the open position with the port B.

On the downward stroke of the main plunger A the oil is forced through the port B and the annular space above the piston valve C, through the main delivery pipe D, to the main bearings, when the piston valve C has uncovered the port B on its downward stroke.

### Auxiliary Plunger

Simultaneously, and in conjunction with the main plunger A, the auxiliary plunger E, which is fitted to the bottom of the plunger A, draws a charge of fresh oil on its upward stroke. This charge is taken through a port in the bottom end of the valve plunger from the oil service tank, through the pipe G, and on the downward stroke of the plunger pump E; the charge of oil is forced upward through the hollow valve plunger, through the port H, and through a hole in the stem of the plunger, which communicates with the main oil delivery pipe D, to the main bearings. At the same time, and in the same sequence, the twin plunger EI draws fresh oil from the service tank, and force the charge to the camshaft bearings through the pipe J, the oil entering the front end of the camshaft through the hollow spindle of the air pump, which is attached to the front end of the camshaft casing. In its passage through the hollow camshaft the oil under pressure is fed through small holes and oil grooves cut in each of the camshaft bearings.

The camshaft rocker arm spindles are lubricated by oil thrown off the revolving cams, which deliver oil into two holes drilled side by side in the upper portion of the hollow rocker arm spindles. These holes communicate with the bearings by small holes drilled radially in the spindle. The lubrication of the rocker arm does not appear to have been very efficiently carried out, as it was noticed that one or more of the spindles had commenced to seize in the cast iron bracket in the camshaft casing.

No outlet holes are provided in the rear end of the camshaft for the egress of oil; consequently the camshaft is entirely under a constant oil pressure, which finds its way through the bearings into the troughs in the bottom of the camshaft housing. The overflow oil returns to the crankcase *via* the air pump, escaping therefrom at the bottom of the air pump crankcase by a 12 mm. pipe running down to the front end of the engine. At the rear end of the camshaft casing oil escapes down the hollow vertical shaft, oil channels being cut in the underside of each of the camshaft bearing bushes for the purpose. The oil that has thus returned by

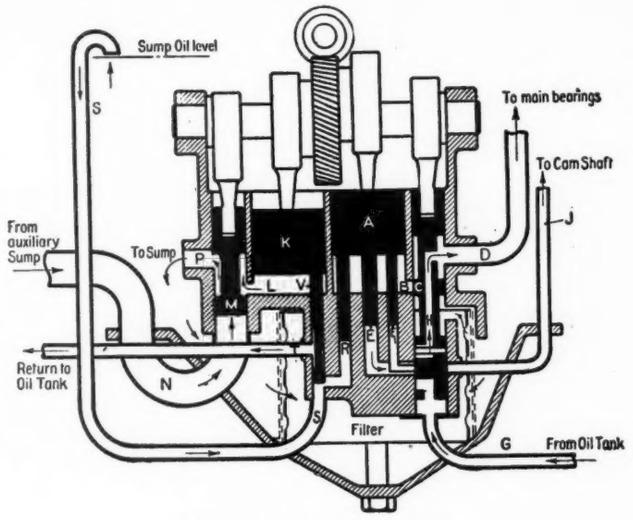



*Fig. 11—Diagram of oil pump*

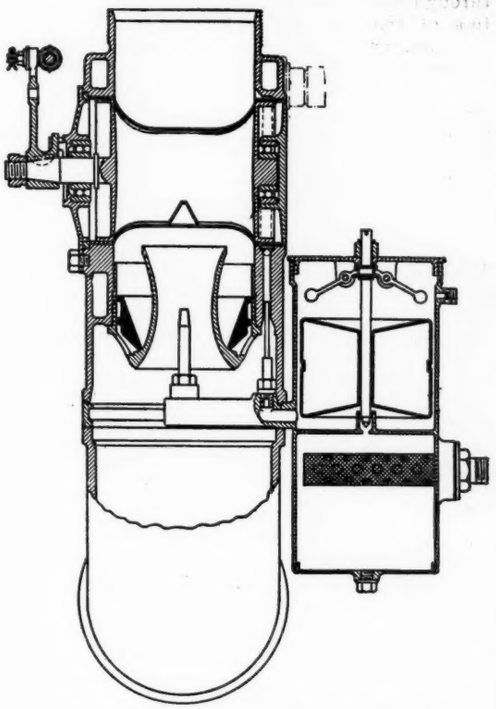


*Fig. 15—Section through carbureter*

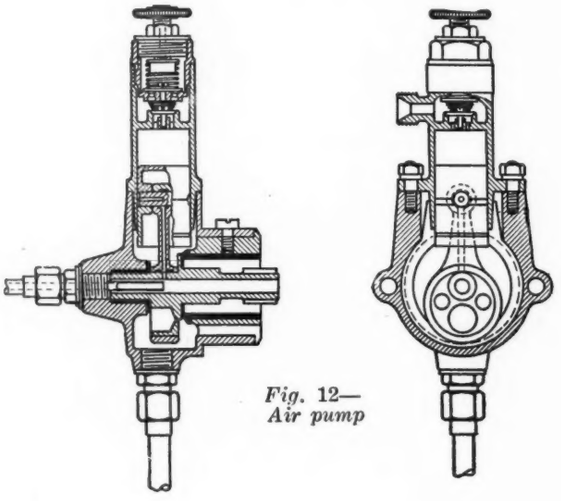


*Fig. 12—Air pump*

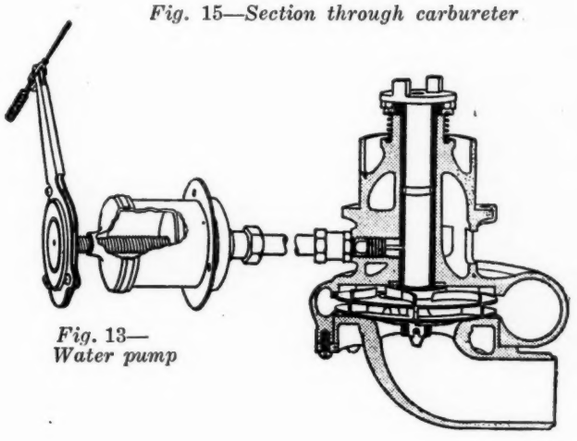


*Fig. 13—Water pump*

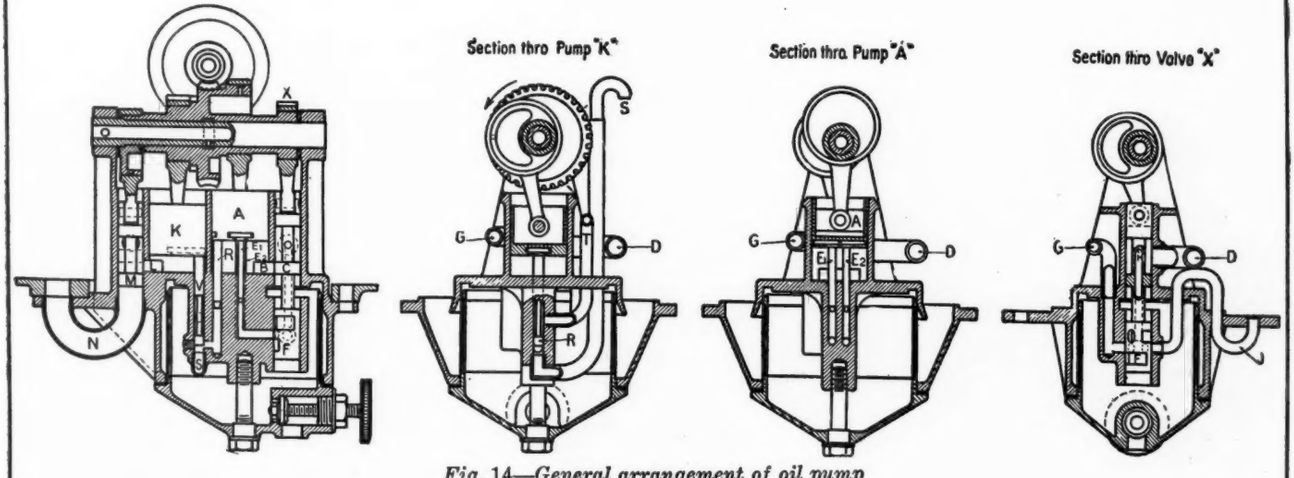



*Fig. 14—General arrangement of oil pump*

gravity to the crankcase is led into the oil sump at the rear through two holes 30 mm. diameter, drilled in the false bottom of the base, and at the forward end of the crank chamber the oil flows into the front auxiliary sump through a wire gauze filter already referred to.

From the front, or auxiliary, sump the oil is drawn by the "scavenger" pump K, Fig. 11, through the port L (cut in the bottom of the barrel), the piston valve M being in its upward position. The oil therefore enters the pump through the large suction pipe N, and is discharged on the downward stroke of the pump plunger K into the sump through the port P, drilled in the side of the piston valve barrel.

To maintain the correct working oil level in the sump, a third plunger R, also attached to the bottom of the main plunger pump A, draws off, through the bent-over suction pipe S, any surplus oil above the working level in the sump, and returns it to the oil service tank through the pipe T, on the downward stroke of the plunger R, this plunger working in conjunction with the piston valve V, which is flexibly attached to the bottom of the suction pump K, in a slot cut in the face of the pump. In the main pressure delivery pipe to the crankshaft bearings, and directly above the oil pump, the pulsation damper valve is located. The details of this valve are shown in Fig. 17, while its exact position may be seen by reference to the general arrangement drawing of the engine, Fig. 3.

In operation the pulsations of the oil pump plungers are damped out in the delivery pipe by the cushioning effect of the spring-loaded plunger, which communicates direct with the pump on its underside. The bottom face of the plunger is prevented from reaching the bottom of the barrel by a small set-screw in the base.

The lubrication of the crankshaft and connecting-rod bearings is on standard lines, and has already been referred to; details of this are shown in the general arrangement of the engine.

### Carbureter and Induction System

Notwithstanding the large size of the engine only one carbureter is employed, and, as will be seen from the illustrations, this is situated low down at the rear end of the crank case. Below the float chamber a gasoline filter chamber is attached, the gasoline entering through a gauze cylindrical filter tube that is screwed into the top of the filter chamber, as shown in Fig. 15. Gasoline enters the bottom of the float chamber, which is of the ordinary balanced needle valve type.

The main jet, which is a plain tube having an orifice of 2.3 mm. diameter, is situated in the centre of the intake inside the choke tube. The choke tube is 32 mm. diameter at the waist and 54 mm. diameter at the largest diameter top and bottom. A barrel type of throttle valve is arranged, 80 mm. in diameter, and mounted on the ball bearings at each end. The races are 35 mm. diameter, and are located in recesses turned in the end covers of the gun-metal throttle valve liner, which is pressed into the cast aluminum body of the carbureter. The semi-elliptical ports in the throttle valve are 80 mm. long by 50 mm. wide at the bottom side and 80 mm. by 55 mm. at the top.

The pilot jet, which is the same length as the main jet, is 0.9 mm. bore at the orifice, and is situated at the side of the intake passage. It communicates with an annular groove machined around the outer end of the throttle valve liner in the body of the carbureter. From this annular channel a passage communicates with the induction pipe just above the throttle valve, which when closed draws air through a V-slot cut in the barrel of the throttle.

A conical suction valve supplies extra air automatically at all speeds through eight holes, 14 mm. diameter, drilled in the annular seating which surrounds the base of the choke tube. The air to the carbureter, as already mentioned, is taken through the interior of the base chamber; the diameter of the air intake passage is 100 mm., and it extends inside the crankcase to the center of the engine.

The throttle valve is water-jacketed by pipes leading from the main water circulation pipe to water spaces cast in the body of the carbureter around the throttle valve.

The diameter of the induction pipe at the joint where it meets the carbureter is 70 mm., this diameter increasing to 100 mm. toward the engine, where it takes a right-angled bend. The pipe is lagged with asbestos cord up to this point.

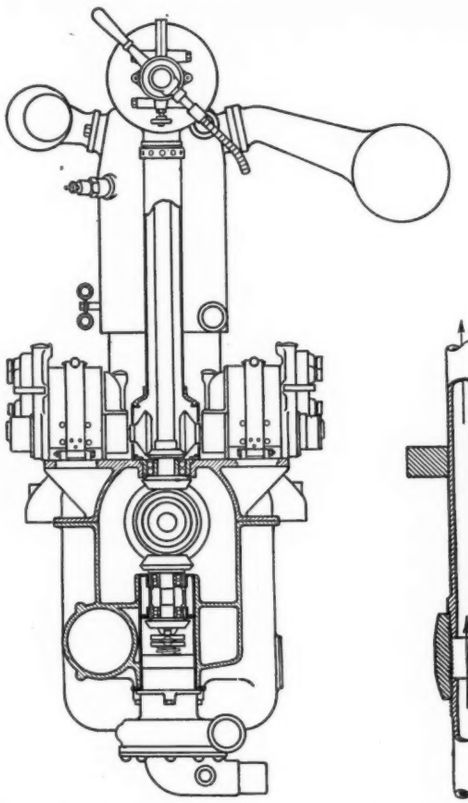


*Fig. 16—Arrangement of camshaft vertical drive*

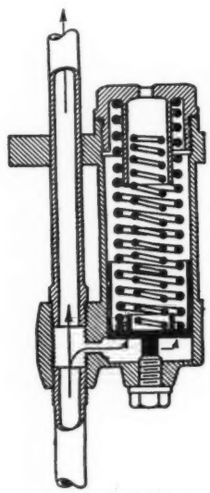


*Fig. 17—Oil pulsation damper*

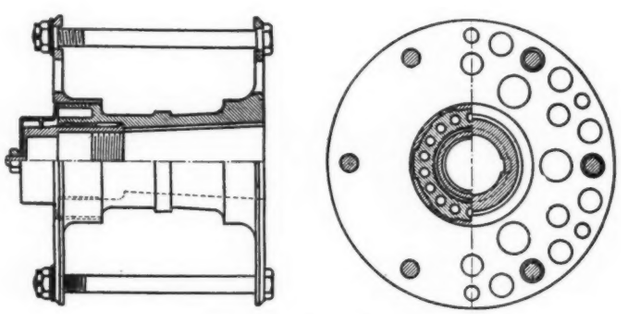


*Fig. 18—Propeller hub*

The design of the top portion of the induction pipe is interesting, the gas being led to the center of the engine by the 100 mm. pipe, whence it enters two branches, 70 mm. diameter, through a port 100 mm. diameter. The two branches lead outward to the inlet ports, three, of course, on either side of the main entry. One half of the branch is enclosed by the main induction pipe. The cylinder ports are 85 mm. long and 50 mm. wide.

### Ignition

Two Bosch magnetos, type Z.H.6, are mounted transversely to the crankshaft upon a bracket at the rear end of the crank case, one being a starter magneto used in conjunction with a hand starter dynamo. The magnetos are driven by bevel gears directly off the vertical camshaft driving spindle, the direction of rotation of both being anti-clockwise. The arrangement of the magneto driving gear is shown in Fig. 16.

All twelve spark plugs are fitted on the inlet side of the engine, and are situated directly below the inlet valves, the high-tension wire being carried in two fiber tubes attached to the side of the cylinders on the inlet side.

Fig. 12 shows details of the air pump, which is driven off

the front end of the camshaft; the bore is 26 mm. and the stroke 27 mm. An adjusting screw is fitted above the release valve for regulating the strength of the spring, the released pressure being taken through the hollow stem of the adjusting screw. An oil trap is provided just below the pump to retain any surplus oil which may find its way past the air pump valve and into the pressure pipe.

An electrical tachometer is driven through a flexible driving cable at engine speed off the rear end of the camshaft.

**Water Pump**

The water pump spindle is driven by a vertical shaft through a bevel gear on the end of the crankshaft, and in the same vertical axis as the camshaft driving spindle. The pump is attached by a flange to the bottom of the sump, next to the oil pump. Fig. 13 shows the constructional details of the pump, which is of the centrifugal type, the water entering below the bottom flanged cover through a 45 mm. diameter port below the rotor. The water is delivered centrifugally from the vanes between the top and bottom disks of the rotor, which is also fitted with vanes upon its top side to throw the water away from the spindle. No packing glands are provided for the driving spindle, but a hardened steel washer is let into a recess machined in the upper face of the rotor, and this is kept in uniform contact with the face of the phosphor bronze spindle bush by the action of a light spring that is fitted under a ball thrust race at the driving end of the spindle. The diameter of the outlet passages from the water pump to the cylinders is 45 mm. Double inlet water connections between each of the six cylinders supply the water jackets at the top and bottom, the diameter of the steel circulation pipes being 40 mm.

With regard to the actual detail construction of the 260 hp. Mercédès engine, practically the only point of novelty is the scheme adopted on the built-up cylinder and head. It is difficult to arrange four valves per cylinder with satisfactory water spaces, and it should be noted that the valve arrangement on the Mercédès engine is particularly good in this respect, ample room for free water circulation being provided. The importance of this point becomes increasingly evident on an engine of the dimensions of the 260 hp. Mercédès, not only on account of immediate cooling problems in running, but in the subsequent effect of such heat and the dangers of distortion in a cylinder of large size.

**A Workmanlike Job**

The 260 hp. Mercédès, it must be admitted, is a workmanlike and nicely completed job, homogeneous in its general layout, and with many minor pleasing points for the scrutinizing designer.

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# Ceco Valve Rotator To Eliminate Pitting

THE Continental Engineering Corp., Omaha, has brought out the Ceco valve rotator, which can be applied to poppet valve types of engines to convert the motion of the valves from a straight reciprocating action to a combination of rotating reciprocating motion. The action of the rotator causes a positive partial revolution of the valve on the up-stroke, and on the return stroke the valve is reseated in a different position from that which it occupied at its previous closing. The objects of the rotator are to render it impossible for carbon deposits to form, and to eliminate pitting in consequence.

It is also claimed that warping and distortion are impossible with the use of the rotator, because unequal heating is avoided by bringing a different portion of the valve head and stem into the path of the flame on each up and down movement. This equalizes the expansion of the metal, it is stated, with the result that the valves will not stick.

Another claim made for the Ceco rotator is that it overcomes the objection of imperfect lubrication. The rotating movement, combined with the lateral movement, according to the Continental Engineering Corp., gives a complete film of oil over the entire bearing surfaces of the stem and guide, and as a result of the compound action, the surfaces of the stem and guide become highly polished.

The makers also claim that the rotator is noiseless, because of the smooth action of the spirals, and by reason of these spirals the teeth at the bottom of the lifter do not ratchet over each other, but engage and disengage by a simple make-and-break contact.

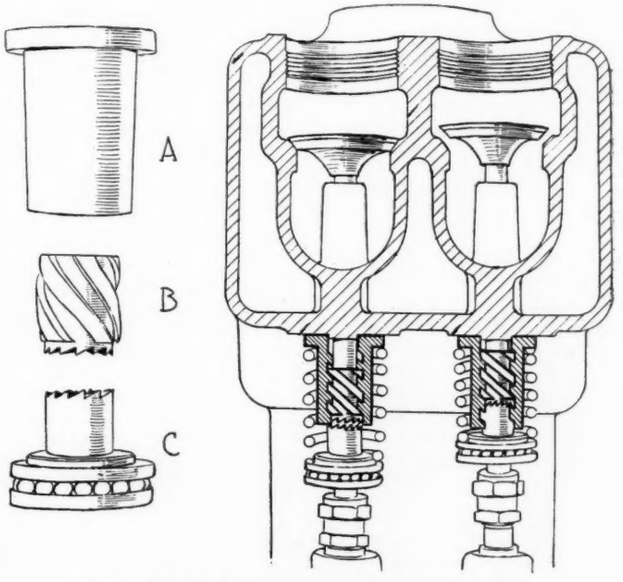
**Rotator Made in Three Parts**

As shown by the accompanying illustrations, the rotator is composed of three parts. There are two parts indicated by B and C, which are mounted on the valve stem, which must be turned down to form a slightly but sharply defined shoulder. The portion *C*, which has an integral head, is locked to the valve stem. Upon this head there is an anti-friction bearing, which permits the valve to turn freely, even when subjected to the action of the valve spring. At the upper end of this part is a set of clutch teeth, adapted to mesh with the teeth cut in the bottom of part *B*, which contains the spiral. This part *B* is mounted loosely on the stem, and at its upper part it has a smooth face, which abuts against the shoulder formed on the valve stem. The thread upon the part *B* engages with the interior spiral threads cut in the part *A*, which is a bronze bushing, having a flanged end secured to the cylinder, as can be noted in the assembly drawings. These parts give the operation indicated above and rotate the valve instead of letting it come down with a straight impact.

The rotator is made in a complete range of sizes to meet the requirements of the valve assemblies of standard engines. The application of the rotator can be accomplished without change in the design of the engine, by simply substituting the bronze bushing for the part where the valve guide is extended.

**Demonstrations to Car Makers**

The manufacturers have arranged to give demonstrations to the different engine makers, who are interested in a device of this kind, by sending mechanics with a set of rotators to any factory upon request. The factories desiring the demonstration must furnish the Continental Engineering Corp. with a detail drawing of the valve assembly of the engine that will be used, showing the lift of the valve, its specifications, and by whom made.




Ceco valve rotator, showing method of mounting

# 12% of Rubber Manufactures Value in Tires

## 1917 Estimate Less Than 25% of 1914 Figure—Rubber Imports from 1900 to 1917 Analyzed

By Morgan T. Riley

MOST of the large demand for crude rubber in the United States comes from the manufacturers of rubber tires for automobiles, trucks, bicycles, motorcycles, airplanes, carriages, etc. According to the Census Bureau's Summary concerning the rubber industry for 1914, 48.8 per cent of the total value of all rubber goods manufactured during that year was represented by rubber tires.

According to the latest figures, the 1917 increase will be smaller than in former years. It is estimated at from 7 to 12 per cent. For the last 2 years the per cent of increase has run as follows: 1915-1914, 11 per cent; 1916-1915, 55 per cent.

A significant fact, illustrating the rapid growth of the industry, is brought out in figures giving the imports since 1900.

The importation of india rubber and gutta-percha has risen from 77,600,116 lb. in 1900 to 320,554,387 lb. in 1916. In few years was there a decrease.

Prices have fluctuated during the last 4 years. Though prices are now higher than 4 years ago, they have nearly doubled the present figures during the past 2 years. Taking first latex pale crepe as an example, it is found that though this grade sold at 67 cents a pound last July, the January, 1917, quotation was nearly double. The same grade sold at 54 cents in January, 1914.

Taking up point by point the market in the immediate future for tires in this country and comparing it with former years, going back to 1900, it is found that since the inception of the automobile, the demand for crude rubber has each year been harder to satisfy. The automobile industry really determines the rubber requirements.

As an index to the adequacy of supply of the rubber market the following prices for crude rubber are interesting:

| | First Latex Pale Crepe London | New York |
|---|---|---|
| 1914 | | |
| Jan. 2 | 27d | 54-55c |
| July 1 | 26½d | 57c |
| 1915 | | |
| Jan. 2 | 24½d | 85-90c |
| July 1 | 30¼d | 64-64½c |
| 1916 | | |
| Jan. 3 | 50¼d | 102-105c |
| July 1 | 27½d | 60-60½c |
| 1917 | | |
| Jan. 2 | 36½d | 79½-80c |
| July 1 | 29¾d | 67c |

So much for rubber.

IMPORTS OF CRUDE RUBBER FROM 1900 TO 1916

| Year | Guayule | Balata | Gutta-Percha | Gutta-Joola-Tong or East India Gums | India Rubber | India Rubber Old and Scrap |
|---|---|---|---|---|---|---|
| 1900 | ..... | ..... | ..... | 427,678 | 8,701,753 | 49,377,138 | 19,093,547 |
| 1901 | ..... | ..... | ..... | 280,560 | 9,371,087 | 55,275,529 | 15,235,236 |
| 1902 | ..... | ..... | ..... | 525,767 | 16,850,821 | 50,413,481 | 22,894,900 |
| 1903 | ..... | ..... | ..... | 316,290 | 13,984,817 | 55,010,571 | 24,659,394 |
| 1904 | ..... | ..... | ..... | 424,617 | 14,887,416 | 59,015,551 | 20,270,970 |
| 1905 | ..... | ..... | ..... | 665,217 | 19,104,911 | 67,234,256 | 15,575,214 |
| 1906 | ..... | ..... | 374,220 | 500,770 | 21,390,116 | 57,844,345 | 24,756,486 |
| 1907 | ..... | ..... | 799,201 | 546,890 | 28,437,660 | 76,963,838 | 29,335,193 |
| 1908 | ..... | ..... | 584,552 | 188,610 | 22,803,303 | 62,233,160 | 16,331,035 |
| 1909 | ..... | ..... | 1,157,018 | 255,559 | 24,826,296 | 88,359,895 | 20,497,695 |
| 1910 | ..... | ..... | 399,003 | 784,501 | 52,392,444 | 101,044,681 | 37,364,671 |
| 1911 | ..... | 19,749,522 | 878,305 | 1,648,921 | 51,420,872 | 72,046,260 | 26,948,000 |
| 1912 | ..... | 14,238,625 | 1,517,066 | 1,204,406 | 48,795,268 | 110,210,173 | 26,293,192 |
| 1913 | ..... | 10,218,191 | 1,318,598 | 480,853 | 45,345,338 | 113,381,359 | 43,385,456 |
| 1914 | ..... | 1,475,804 | 1,533,024 | 1,846,109 | 24,926,571 | 131,995,742 | 25,958,261 |
| 1915 | ..... | 5,111,849 | 2,472,224 | 1,618,214 | 14,851,264 | 172,068,428 | 11,006,928 |
| 1916 | ..... | 2,816,068 | 2,544,405 | 3,188,449 | 27,858,335 | 267,775,557 | 16,371,573 |
| Total | ..... | 53,610,059 | 13,577,616 | 14,903,411 | 445,948,272 | 590,252,964 | 395,977,751 |

TOTAL ANNUAL IMPORTATION OF INDIA-RUBBER AND GUTTA-PERCHA

| | | | |
|---|---|---|---|
| 1900 | 77,600,116 | 1909 | 135,096,463 |
| 1901 | 80,162,412 | 1910 | 191,985,300 |
| 1902 | 90,684,969 | 1911 | 172,691,880 |
| 1903 | 93,971,072 | 1912 | 202,258,730 |
| 1904 | 94,598,554 | 1913 | 214,132,795 |
| 1905 | 102,579,598 | 1914 | 187,735,511 |
| 1906 | 104,865,937 | 1915 | 207,128,907 |
| 1907 | 136,082,782 | 1916 | 320,554,387 |
| 1908 | 102,140,660 | | |

IMPORTS OF INDIA RUBBER AND GUTTA-PERCHA FOR THE 10-MONTH PERIOD, JULY 1916-APRIL 1917

| Month | Guayule | Balata | Gutta-Percha | Gutta-Joola-Tong or East India Gums | India Rubber | Old and Scrap India Rubber | Total |
|---|---|---|---|---|---|---|---|
| 1916 | | | | | | | |
| July | 61,444 | 148,639 | 210,558 | 1,392,109 | 14,734,388 | 811,431 | 17,358,569 |
| Aug. | 274,645 | 204,256 | 632,079 | 4,254,623 | 17,861,488 | 1,279,622 | 24,506,713 |
| Sept. | 244,940 | 229,287 | 585,535 | 1,117,146 | 18,595,917 | 736,245 | 21,509,170 |
| Oct. | 180,626 | 335,778 | 112,797 | 1,469,279 | 21,880,771 | 1,256,325 | 25,235,576 |
| Nov. | 144,090 | 250,374 | 4,437 | 1,265,829 | 19,547,263 | 1,670,864 | 22,882,857 |
| Dec. | 294,386 | 328,784 | 132,596 | 569,437 | 25,717,299 | 1,857,815 | 28,900,317 |
| Total | | | | | | | 140,393,202 |
| 1917 | | | | | | | Total |
| Jan. | 52,402 | 310,677 | 378,241 | 3,419,835 | 36,101,787 | 1,951,049 | 42,213,991 |
| Feb. | 157,539 | 223,484 | 28,365 | 1,519,602 | 19,324,607 | 1,645,826 | 22,899,423 |
| Mar. | 213,961 | 305,628 | ..... | 348,163 | 38,359,211 | 2,497,784 | 41,724,747 |
| Apr. | 328,545 | 412,467 | 328,735 | 862,933 | 34,736,265 | 1,661,744 | 38,330,689 |
| Total | | | | | | | 145,168,850 |
| 10 Mos. | 1,952,578 | 2,749,474 | 2,413,343 | 16,218,956 | 246,858,996 | 15,368,705 | |
| Total for 10 months | | | | | | | 285,562,052 |

*Including commercial vehicles.

### Large Mica Deposits in Texas

VAN HORN, TEX., Sept. 8—The fact that enormous quantities of mica are used in the automobile trade makes the development of what is said to be one of the largest known deposits of this mineral in the world, situated near here, of unusual importance. The property is owned by the West Texas Mica Company of which Seton Keith of San Angelo is president. This mineral deposit covers a surface area of approximately 1260 acres. The outcroppings occur at many points and it may be mined at comparatively little cost.

Mr. Keith estimates that the deposit contains more than 150,000,000 tons of material. The development of this big property is regarded as not only of great importance to the automobile and building trades, but the mica sheets and blocks that are available will go to make up largely the supply of this material which is now obtained from foreign manufacturers.

### Largest Airplane Field at Dayton

DAYTON, OHIO, Sept. 10—The largest airplane field in the United States, with a capacity for training 2400 men, is being constructed at this city by 2500 workmen, 850 teams of horses and scores of tractors.

More than 100 buildings have been erected and hundreds more will be constructed. Each building is placed in use as soon as finished and more than 300 student aviators are now encamped on Wright Field. Three kinds of machines are provided—the Curtiss, the Wright bi-plane, and the standard model used by the Allies. There are small machines built for speed of 150 m.p.h. or more—machines built for rapid ascension, and heavy airplanes designed to carry six men, machine guns and bombs. It is expected that there will be 6000 to 8000 machines in the hangars for the 2400 students, each hangar having a capacity for eight machines. The complete field will be finished within several months.

# The FORUM

## Ball Bearing Crankshaft Advantages

By W. J. P. Moore

THE article in your recent issue by Granville E. Bradshaw should arouse renewed interest on this very important and much neglected subject. The criticism by Mr. Bradshaw of the great defects and shortcomings in the supposedly modern and up-to-date automobile and aeronautic engine with its plain bearings is only too true, and as he so clearly points out, while ball and roller bearings are used everywhere about the automobile, and without these the automobile could never have approached the perfection it has, yet in the engine itself, the heart and power of the whole machine, designers have failed to adopt them.

As the value and necessity of using ball bearings has been thoroughly proven everywhere they have been adopted, why has not their use in the engine itself become more general?

Probably one reason is that in many cases in the early engines fitted with ball bearing shafts before there was the wide experience that engineers now have, the bearings were improperly selected and those fitted were *too small* and therefore did not give the satisfactory results they should and this probably led to their general condemnation as applied to engines. Of course it is recognized that the ball bearings must be of ample size and when properly selected they can be relied upon to give many years of satisfactory service.

Some designers have attempted to combine the use of plain and ball bearings in the same crankshaft (that is the mainshaft not the crank pin), which probably helped to give the ball bearing crankshaft a black eye.

### Bearings Often Too Small

Undoubtedly most of the designers of ball bearing shafts have selected their bearings altogether too small, but for what reason it is of course impossible to say, but it almost seems as though they entirely overlooked the fact that the *real load* on the bearings consists of a series of *sudden hammer-like blows* due to the rapid ignition of the gases in the cylinder and there should never be any difficulty experienced with ball bearing crankshafts when this has been taken into consideration and allowances made.

From my own observation of the sizes of ball bearings used on some shafts I am convinced that the *ignition blow* has been entirely overlooked and my own impression was that the line of reasoning followed by the designer was that a bearing that was sufficiently large for the mainshaft bearing in the gearbox should be adequate for the engine, the power transmitted being the same in both cases.

Another reason frequently given for not making ball bearing crankshafts is on account of the alleged expense, although this is often exaggerated and fair comparisons are not made.

The main fact should not be lost sight of that in any fully equipped ball bearing crankshaft you have ideal conditions for cheapest manufacture with machine tools and fine workmanship, insuring interchangeability and an entire absence of hand work and fitting and scraping of bearings and adjusting of shims, etc. It is always this hand work that is the most expensive and the most unsatisfactory, as it brings in so largely the human element and experience and judgment as to what is really the proper adjustment; and when improperly done of course it is not only useless but a serious menace.

In these days of big productions and quick assembly the result is there is no *real effort* made to properly scrape in and adjust the plain bearings as now used. If the ingenuity and expense that are expended in devising intricate and complex oiling systems that are necessary to make a plain bearing crankshaft work were put into the design of the really efficient full ball bearing crankshft and the amount that would be saved in the assembly of the latter was taken into consideration it would be found probably that there would not be such a great difference in the costs of the two types of shafts, or at least of the engine as a unit.

Compare the simplicity of the ball bearing crankshaft engine with the plain bearing engine. In the former it is not necessary to have any oil pumping system with its various working parts and piping and troughs, resulting in a saving in weight, and complications in the underpan of the engine.

A considerable saving in the quantity of oil used results, and the splash system is all that is required for the bearings, for a very small quantity sufficies even if supplied somewhat intermittently and you are not worried with the fear if the oil supply fails you for a minute you are lost as in the case of the plain bearing shaft.

It is the greatest satisfaction and comfort to feel the engine bearings will run indefinitely and without any adjustment or trouble; and there is no reason why a properly designed full ball bearing crankshaft should not run for 100,000 miles without being touched and without undue wear.

The illustration shows a ball bearing crankshaft used in a number of engines built in 1905-1906, one of which has been run 80,000 miles and another 50,000 miles, and the crankshafts have never been taken out of these engines and the bearings are in good condition to-day. Unfortunately ball bearings were not fitted in the crank pins and of course these have required adjustment from time to time. It is in the light of the above experience that the statement of a possible 100,000 miles is made.

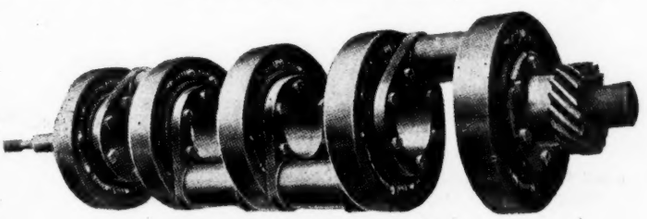
### One Piece vs. Built-Up Shafts

When ball bearings are adopted the built-up form of shaft lends itself better to the fitting of the bearings and also is probably lighter. The shaft referred to above, it will be noted, is of this type and although fitted with five bearings for a 4½ by 5½ in. four cylinder engine only weighed 40 lb. and no special effort was made toward extreme lightness.

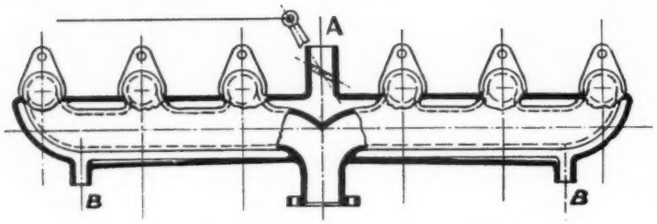
The built-up shaft units are all alike except the end sections and are easily drop forged. Built-up shafts are universally adopted for large marine engines and should be equally suited for this class of work, and have that advantage that if anything does go wrong only a section may be required to be replaced. The ball bearings are more easily mounted on the shaft and a better selection of sizes may be adopted as they do not require to be threaded over the shaft, and further special adjustment collars and clamps are not required. Further, the five bearing shaft is preferable for rigidity and balance and requires no more distance between centers of cylinder than single piece shafts and weighs no more.

In the case of the 4½ by 5½ engine referred to above which had separate cylinders the distance between centers was only 5 in. and at that time it was the shortest engine of its size ever made. Of course the crankshaft in an up-to-date high speed engine would require to be counter-weighted and here again the built-up shaft lends itself to this balancing.

Further, if desired the inner race of the bearings might be formed from the crankshaft itself the same as shown by Mr. Bradshaw's drawing, although it would seem to be preferable to have the bearings a separate unit and even if this was



Shaft used by W. J. P. Moore




Cramer's design for exhaust heated manifold with temperature control

done with a built-up crankshaft it is probable that the weight would be no more than the construction shown, as much of the advantage in weight that should be gained seems to be lost in Mr. Bradshaw's design by the use of a greater number of bearings on the shaft, entailing, of course, increased length of the shaft itself.

Undoubtedly Mr. Bradshaw's analysis of the relative costs for the two types of engines is correct and if a careful and fair comparison is made the ball bearing engine does not come out so badly. Many engineers are probably inclined to prejudge the matter and assume that because the initial materials cost is greater the final cost must be also.

## Heating the Mixture Thoroughly

By V. P. Cramer

OUR present methods of heating mixtures are briefly as follows:

1—The use of radiator shutters operated by thermostat and by hand to keep the temperature of the cooling water at the most efficient point.

2—Hot-air stoves to heat a portion or all of the air supply to the carbureter.

3—The use of integrally cast inlet and exhaust manifolds.

The first method is good after the motor has warmed up, but the first "get-away" is exasperating. The second method is good as far as it goes. It is practically indispensable and universal but open to the fault of reducing the volumetric efficiency to quite an extent, consequently reducing the motor power. The third method furnishes plenty of heat, but the amount of heat is uncontrollable for different seasons and fuels and, in the opinion of the writer, is out of the question at least for passenger cars.

The location of the manifold in respect to the inlet valves is another important feature to think about. In the past year or two we have heard much about and experienced the fact that our gasoline in some way refuses to burn and gets by the pistons and into the lubricating oil, thereby spoiling the lubricating qualities.

As far as the writer can determine there are three locations for the inlet manifold; above the inlet valves, on a line with the inlet valves, or below the inlet valves.

In the first location this was good when we had a fuel that would ignite when a flame touched it, but with a fuel as at present the only effect, particularly upon starting a cold motor, is to load up the cylinders with gasoline that refuses to burn and have this surplus pass down by the pistons into the lubricating oil, and the same is true of the second location.

In the third location, in the opinion of the writer, we have the best condition. The majority of the surplus gasoline is held within the manifold until such time as it is vaporized by heat and passes into the cylinder and does work. During the past winter excellent opportunities were given for studying the above conditions with the conclusions stated above.

The next question was how to keep the manifold below the inlet valves and have it heated quickly and with the right amount of heat. The manifold cast inside the water jacket is good after the water is heated, if there is some way to keep the water hot.

The next thing that came to mind was why not have an outside manifold, exhaust heated, and the amount of heat controlled either from the dash or by thermostat if a satisfactory one can be found. The sketch shown herewith will serve to illustrate my point. This shows an inlet manifold surrounded by a jacket into which the hot exhaust gases enter at A under control of the butterfly valve shown, and leave at B. The bottom of the jacket should be sloped as shown to allow the condensed products of combustion to escape.

Should it prove more desirable to control the temperature by thermostat I would suggest that this be done by a single thermostat controlling the outlet B. At this point the temperature of the exhaust gas would be cooler and more variable.

## Why Drain Automobile Tanks Unnecessarily?

By B. W. Dunn

*Chief Inspector of the Bureau of Explosives, New York*

THE experience of the Bureau of Explosives indicates that the metal supply tanks of automobiles are safe containers for gasoline and that the draining of these tanks on railway property has proved to be a dangerous and unnecessary practice.

The Bureau for the Safe Transportation of Explosives and Other Dangerous Articles was organized under the auspices of the American Railway Association in 1906, and enforces the regulations of the Interstate Commerce Commission covering the transportation of explosives and other dangerous articles by freight and by express.

It should be appreciated that it is very difficult to drain all of the gasoline from the tanks of automobiles without spilling some of it, and when the draining is done at night in the presence of a lantern, this leakage is almost certain to cause a serious fire. The discharge valve is usually in some inaccessible location and the opening of it often results in the liquid running over in spite of all precautions. The primary reason for this is that the regular draining of these tanks is not provided for; it is an unusual process and while the automobile manufacturer necessarily provides for the filling of the tank, he does not provide ready means of draining it.

Arguments from automobile companies in favor of the practice have been received by this bureau. and they are to the effect that it is a desirable thing to do, especially where a gravity gasoline tank is used. Some pleasure cars are provided with a pressure feed system, but the gravity feed system is used in trucks and frequently the float valve leaks slightly, which may cause a dangerous situation in shipping long distances. In our opinion this same danger would be present in the pressure feed system, if the pressure were accidentally left on. If the pressure is removed it is only necessary to have the engine run until the gasoline is entirely exhausted from the carbureter to remove this particular hazard.

### Draining Tanks Against Rules

The draining of these tanks is now not only contrary to the recommendations of the Bureau of Explosives, but contrary to classification rules. Following fires which occurred in 1909, in which draining was done on carrier's property, the writer took this matter up with the chairmen of the various Classification Committees to show them the difficulty which was being experienced in carrying out their requirement for draining. It was pointed out that in draining gasoline from the tanks in railroad cars, the car was soon filled with vapor and it was only necessary to add the presence of a lighted lantern to cause a serious fire. It was also stated that the supply tank with its drainage cocks properly closed was a much safer package for gasoline than many of the metal cans and barrels generally used in transportation.

The drainage of automobile tanks before shipment serves no useful purpose. Draining them on railroad property constitutes a severe fire hazard to the railroad property and should be absolutely prohibited. If shippers desire to drain tanks away from the railroad property, they of course should have that privilege. That they would elect to move these cars with some outside power into railroad property and on cars is improbable.

# Boston Settlements Organize Industrial Relations Work

## Neighborhood Houses, Independent of Factory or Employees, Provide Recreation, Encourage Health and Sanitary Measures—Supported by Private Subscriptions and Dues—Each Community a Unit

INDUSTRIAL relations work in Boston is carried on by disinterested parties. The recreation, the health education campaigns, the effort to secure good housing conditions, all those extra-factory activities directed toward improving the status of the working population, are largely carried on in Boston by settlement houses which are supported by private subscription and, to a very small degree, by the dues of the members.

A settlement house is similar in the general features it provides to the type of clubhouse provided for the workers by the Goodrich, Goodyear, Firestone, Reo and other companies whose industrial relations work has been described in recent issues of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES. But, though the neighborhood house system does the same work as the factory clubhouse and deals with the same sort of population, its fundamental principle is different. The factory clubhouse is designed to produce better workers, to interest men in the plant, and to reduce labor turnover. The settlement house, on the other hand, aims to produce better human beings. It takes its immediate geographical neighborhood as the unit to be stabilized and improved, rather than the factory.

### Where Manufacturer Gains Under Settlement System

1. The factory labor department is relieved of the "outside" work often found necessary, such as:
   a. Looking after housing conditions.
   b. Providing a clubhouse and athletic ground for the workers.
2. The administration is relieved of the difficult situations which may arise when the factory concerns itself with the home life of its employees.
3. Better health, better living conditions, fuller opportunities for recreation are open to workers who wish to take advantage of the settlement system, without the manufacturer being committed to any financial outlay.

### Manufacturers Pleased with System

The fact that the interests of the factory are not consciously cultivated, however, does not prevent the settlement system from being beneficial to industry from the manufacturer's as well as from the worker's angle. No factory is completely independent of the community, and any betterment of the region in which a plant or its workers are located tends to work favorably for the industry itself. It is significant that no factory within the limits of metropolitan Boston has found it necessary to carry on industrial relations work of its own on a large scale. The majority of the industrial heads of Boston are on the list of the patrons of Boston's settlement houses. Their subscriptions are sought, not on the ground that any one factory will gain, but that industry as a whole has a sounder and more stable existence when it can draw on a healthful and happy working people.

### Neighborhood Houses Practicable in Cities

In a large city such as Boston the plan of having neighborhood houses is more workable than to have factory clubhouses. For in the big city the employees of any given factory do not necessarily live near it, nor do they live in any one section of the city. It is much easier for them to attend the community center in their neighborhood.

In Boston there is a settlement house for every district where there is an industrial population. Each house has an independent administration, although in recent years there has been a central council which has threshed out common problems. Among the more important of these institutions are South End House, Elizabeth Peabody House, Denison House, North Bennett Street Industrial School, Lincoln House and Ellis Memorial.

### Diversified Activities

These settlement houses undertake to do as much for the working population as does the Goodrich company, for instance, for its employees in Akron, Ohio; and because of their neutral position they are able and interested to engage in more lines than a factory might care to undertake.

The oldest settlement in the city is the South End House; and a description of its activities will indicate fairly clearly the type of work carried on in each of the large settlement houses of Boston.

### Occupies Four Buildings.

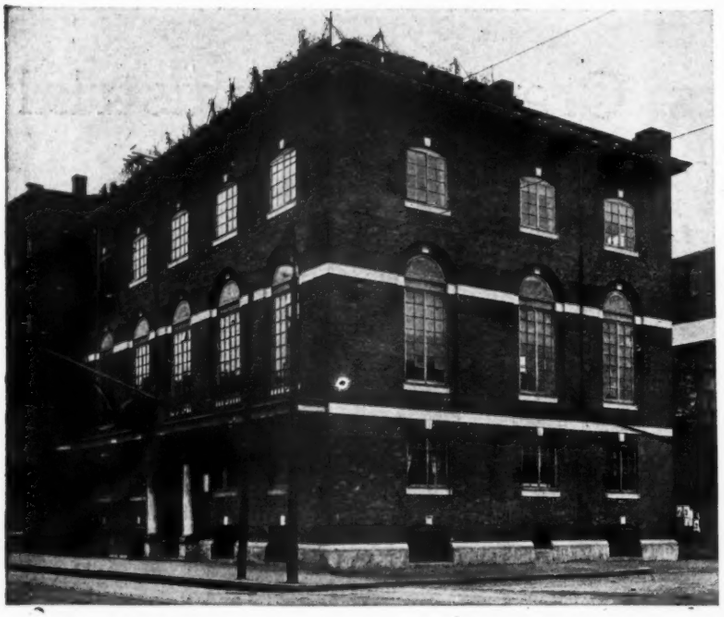
Four buildings are needed at South End House to take care of the work with the population of that neighborhood. The main plant is called South Bay Union, where the majority of the clubs and classes are held. The other houses are a men's and women's residence, where members of the staff live and where the administrative work is planned and directed; there is also a registry bureau for furnished room houses. There are also four smaller centers in this neighborhood under the direction of South End House.

Emphasis is laid on the health of the children. Pre-natal instruction is given to the mothers of the community by trained nurses. There is a Babies' Good Government Assn. attended by the mothers and infants of the neighborhood where the former learn the proper care and feeding of babies. There is also a class to take care of the children from 2 to 4 years of age, after they have passed from babyhood and are not ready for kindergarten. A healthful vacation for 2 weeks or more at a nominal rate is provided for children up to 14 years of age at Winning Farm, Lexington, Mass., every summer. The older boys of the neighborhood are taken to camp in the White Mountains, where they are able to earn their keep and more by caddying at the summer hotels.

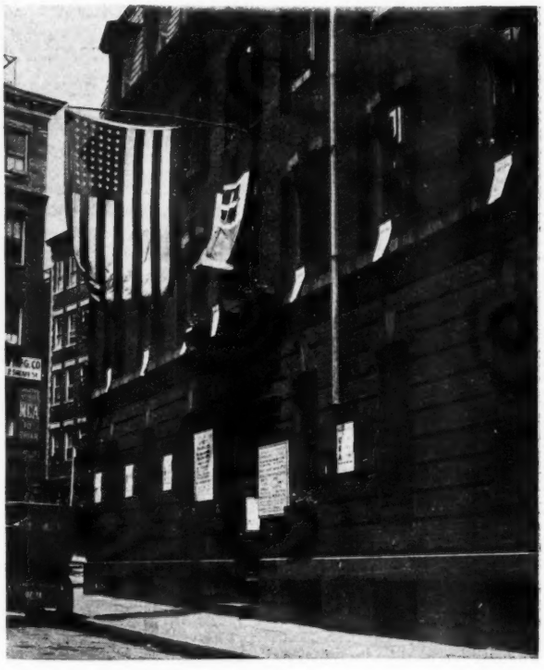
In connection with the health work there is a milk station where pure milk for the babies can be obtained at a reasonable rate. There are cooking classes at the South Bay Union, where the girls are taught to make simple dishes in an inexpensive way. A visiting doctor has daily office hours at the South Bay Union. He makes such calls as are requested by the people of the neighborhood; and gives a physical examination to all of the children who are about to go away to farms or camps. Provision is also made for the examination of the teeth of the children who attend the clubs and classes of the house, and where treatment is needed they are recommended to the city dental clinic. There is also a resident doctor who renders considerable service. In fact, the South Bay Union is a local organizing center for medical service.

Athletics is a prominent feature of settlement house work. The South End House does not need its own field and gym-

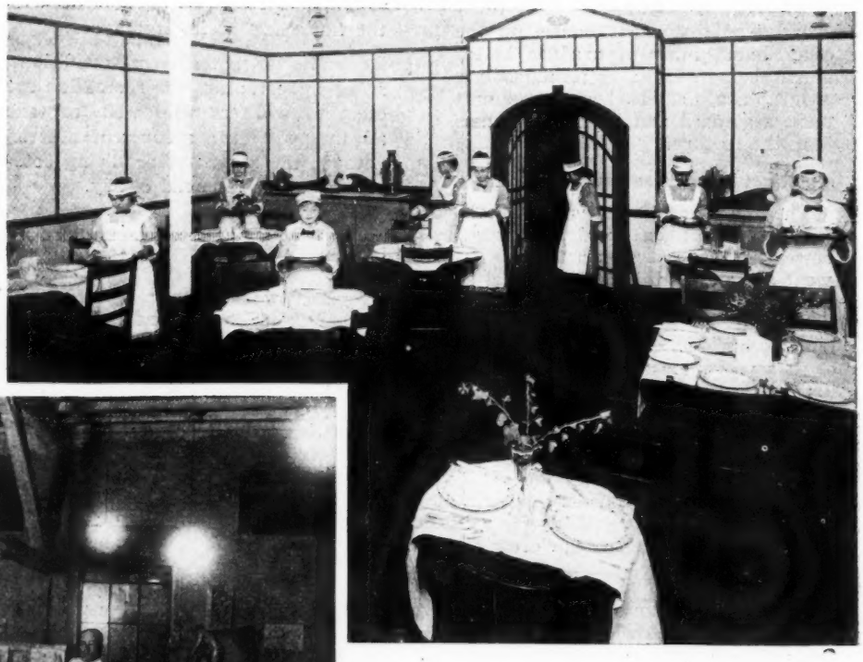
# Neighborhood Houses in Boston, Mass., Doing Industrial Relations Work



Above—South Bay Union is a pioneer in the community clubhouse movement. It is used by a working population, partly supported by their fees, but largely maintained by private subscription. The building serves as a center for teaching health methods, organizing recreation, and providing medical service where necessary



Right—Exterior of the North Bennett Street Industrial School, which maintains a number of classes training men for various trades. This house is a feeder of trained workers to the industrial enterprises of Boston



Right—The relation of girls' cooking classes, such as the one shown in this picture, to industrial efficiency is very close. The North Bennett Street organization teaches the daughters of the family how to prepare food with the maximum of taste and the minimum of cost

Left—Change of labor is said to be one of the best forms of recreation, and this shows some workers at play learning to be sculptors. There is nothing amateurish about this class at North Bennett Street, however, as some of those in it will use their training to direct practical advantage

nasium as the Randolph Street city playground is within two blocks of South Bay Union, and the city gymnasium is next door to the Union. A junior baseball league is organized by the workers of the South End House on the Randolph Street grounds, and basket ball is the winter sport enjoyed by the young men. An inter-settlement basket ball league makes the interest and competition keener. Gymnasium classes and instruction in esthetic dancing are provided for the girls.

**Much Time Given to Dramatics**

Dramatics is an important branch of settlement house work. There is no factory clubhouse which has developed this type of recreation to the extent achieved by a number of the settlement houses in the United States. Yet this is one of the most popular forms of recreation in Boston neighborhood houses, as well as being instructive. The South End House has five dramatic companies made up of the young people of the neighborhood. These companies are coached by a worker who gives all her time to this one interest. The South Bay Union is equipped with a small hall having a capacity of about 300 and a stage of proportionate size. All the scenery and hangings are made by local talent. At the end of each winter season each group presents a play in competition with the others to determine before a board of judges which company has done the best work for the year. There is also an inter-settlement dramatic association which provides that the company of one house will sometimes exchange performances with the company of another settlement.

**Social Clubs Popular**

Clubs organized for purely social purposes are a popular branch of the settlement house activities. Usually these clubs are for boys only, or girls only, up to the age of 14, but after that there are a number of societies having members of both sexes. At South End House in addition to the numerous small clubs there is a big group known as the South Bay Neighborhood Assn. made up of the parents, young people, and social workers of the neighborhood. This association appoints committees each year with which to carry on the season's work.

As in most factory clubhouses, the members of the clubs are in charge of much of the detail management of the organization. The young people's clubs of South Bay Union have a central body to run local affairs known as The City. This body is made up on the same plan as the City of Boston, having a Common Council and Mayor elected by the constituents. This scheme affords a satisfactory organization for Young People's Assn., and at the same time familiarizes the members with the civic structure of Boston.

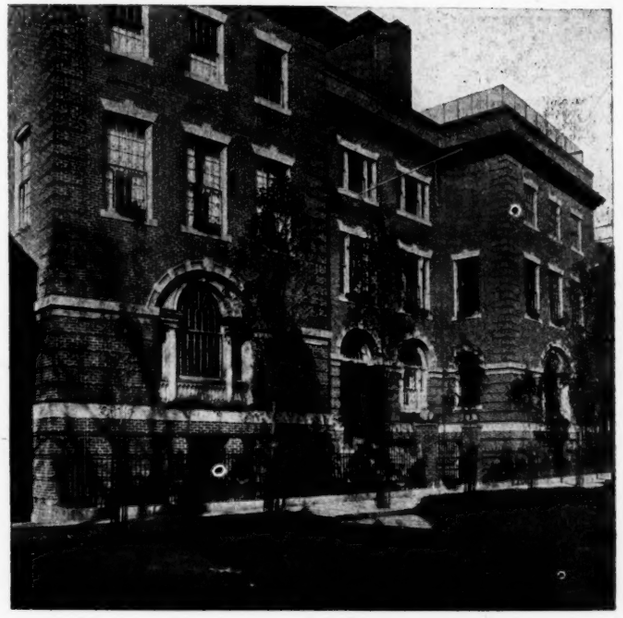
**Thrift Encouraged**

A stamp saving system is carried on by the settlement houses of Boston to encourage the workers to save part of their wages in order to be able to pay cash rather than instalments or to lay money by for emergencies. Under this plan the member of the stamp club buys savings stamps up to the amount of money he or she can afford. The saver is given a booklet in which the stamps purchased are pasted. Each week the worker buys the number of stamps desired and keeps them in the booklet until the amount desired has been saved. The booklet may be redeemed at the face value of the stamps any time the investor desires. Settlement house workers make noon-day visits once a week to some of the Boston factories where the employees are encouraged to save a certain amount out of the pay envelope each week.

**Settlements Work for Better Housing**

Another problem which the settlements tackle is that of housing. Although nothing has been done in the way of creating residence parks, as has been tried by factories located in a rural or suburban community, the settlements try to improve the existing facilities. In the rooming house section of the South End, the South End House maintains a room registry. All the furnished room houses which are willing to undergo inspection are allowed to register at this bureau, and those which pass inspection are put on a preferred list of the bureau and recommended to prospective lodgers.

In the tenement section of this community the South End



Lincoln House has a modern building which provides clubrooms and other recreation facilities for the entire family. Notice the flower boxes in a number of windows which help to give a habitable appearar ce to the structure

Settlement has a model housekeeping center in which some of the workers live to show how the maximum of cleanliness and comfort can be obtained from the facilities at hand. In cases where community action may hope to win improvements from the city, campaigns for local changes are sometimes launched. The South End Improvement Society which has its headquarters in South End House by vigorous campaign secured a new sewage system for the district.

Other settlements in Boston are doing a similar work. Elizabeth Peabody House, Lincoln House and Denison House look after the health, recreation and sanitation of their respective city neighborhoods. North Bennett Street Industrial School has an elaborate plant which trains its members for various trades.

The Boston Settlement system, in short, organizes the home life of the working population. Instead of serving a group of persons at one factory, as is the case where a manufacturing establishment runs a clubhouse, the settlement takes the neighborhood as the unit.

## Hawaii Sugar Planters Use Tractors

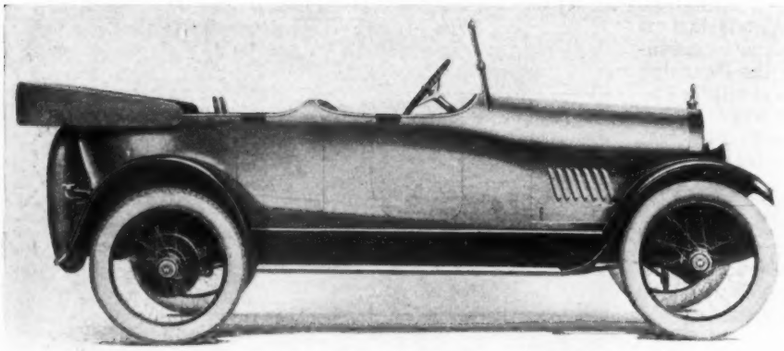
TRACTORS are being used extensively on sugar plantations in Hawaii. There were only three of these machines in use on these islands in 1912; to-day there are 104. Hauling wagons of cane to the mill is a common use for tractors in the district of Kohala, Island of Hawaii. Loads of 50 tons per trip are not unusual. Two plows attached to a small engine are sometimes used for furrowing; and occasionally cane has been cultivated by a ten-plow outfit which has a capacity of 11 acres per day.

Tractors have been used for the past 2 years in hauling cane cars over portable tracks. The engine straddles the tracks which hold 15 to 20 carloads of cane at one time. The important factor in this method is the absolute control of the load on steep grades, going either up or down.

Motor trucks are also coming into use extensively on the plantations. The overseers and timekeepers usually have light vehicles. This enables them to get around quickly and means that the working force can be more efficiently supervised.

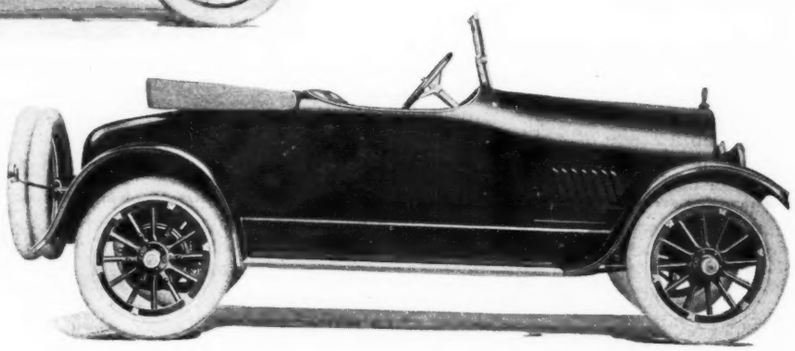
Motor vehicles are also being used for hauling men to and from work, and for carrying seed and fertilizers to the field. The growth of the use of motor power on the island would indicate that the amount of time saved more than compensates for the added cost.

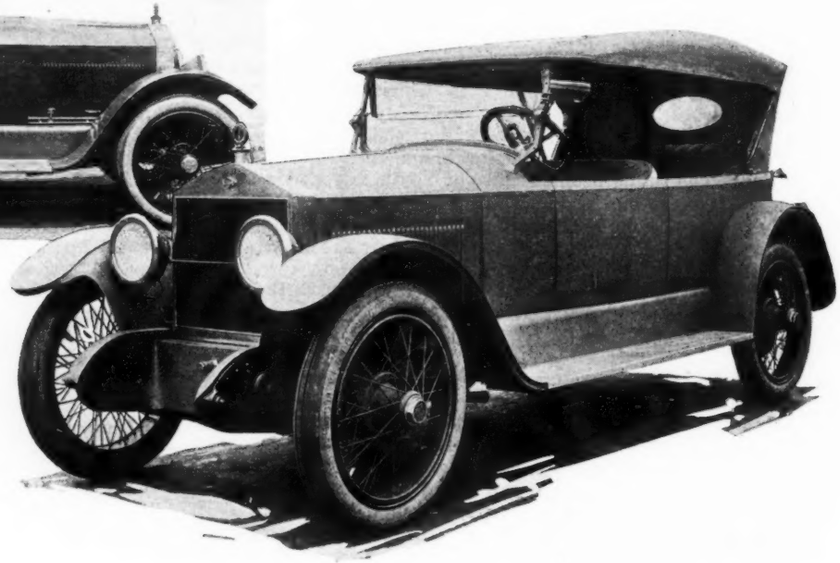
# Body Design Shown Car Models



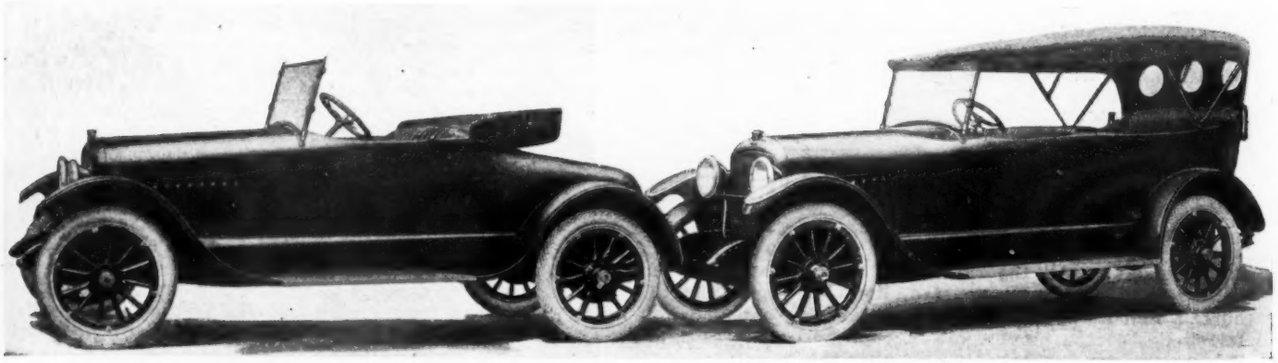
*Above is the six-cylinder, seven-passenger Westcott mounted on the standard 125-in. chassis. Note the smooth body lines, wire wheels and general harmonious effect*

*At the right is the Westcott four-passenger roadster with rounded rear deck and flat-lying top. Like the touring car, it has a slanting windshield. Each of these models sells for $1,790*



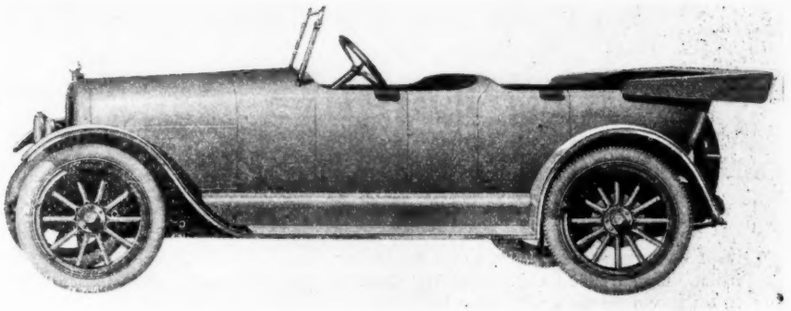


*The two new Murray models. Above is the roadster, which is distinguished by a modulated curve of the dominant body line from front to rear. At the right is illustrated the four-passenger touring car, which also has a distinctive style. Both bodies are of aluminum throughout and the roadster has two auxiliary seats. They are mounted on the same 128-in. eight-cylinder chassis as the seven-passenger and sell for $2,800*

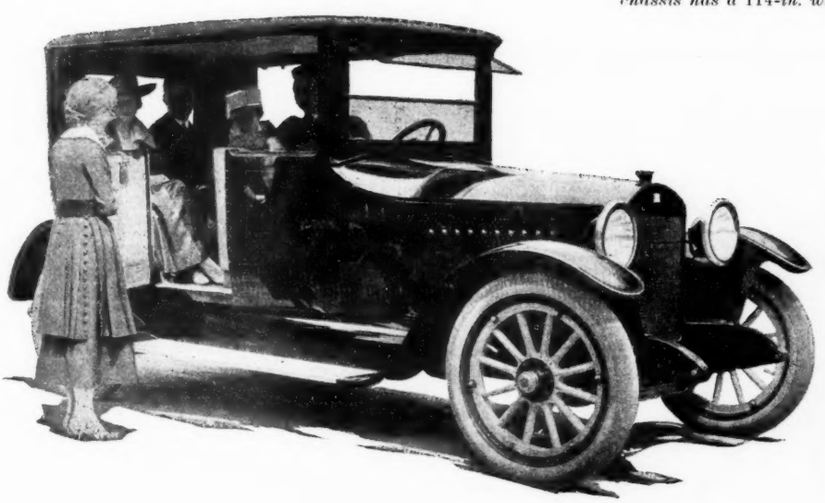


*Roadster and touring bodies mounted on the new Ross six-cylinder, 130-in. wheelbase chassis and selling at $1,750. Wire wheels are supplied at extra cost. These bodies are featured by rounded lines and good proportions*

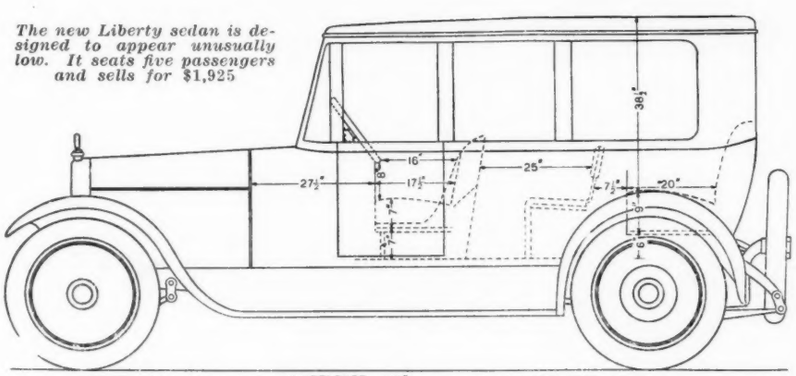
# Tendencies in the for 1918

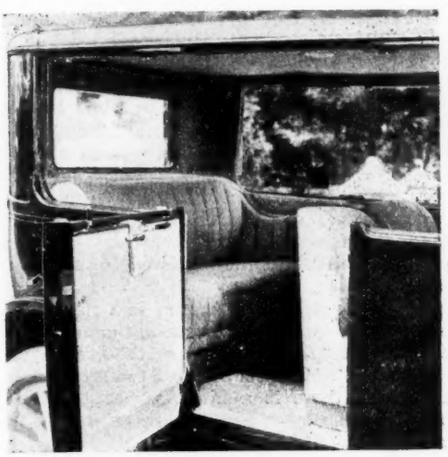


*New six-cylinder Moon touring car which differs from previous models in that the slope from radiator to dash is straight. The chassis has a 114-in. wheelbase and the price of the car is $1,095*

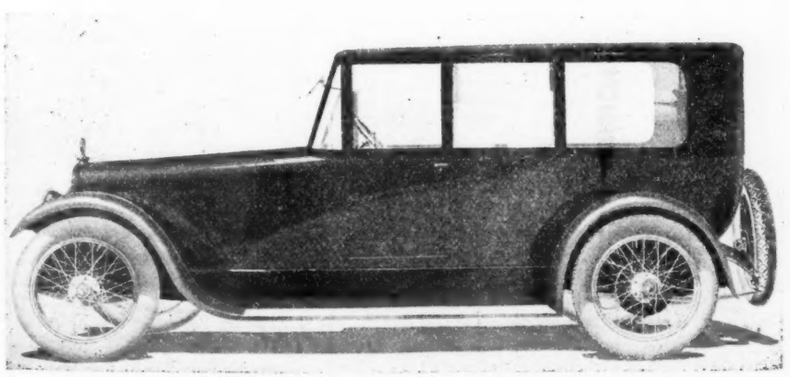


*The new Liberty sedan is designed to appear unusually low. It seats five passengers and sells for $1,925*

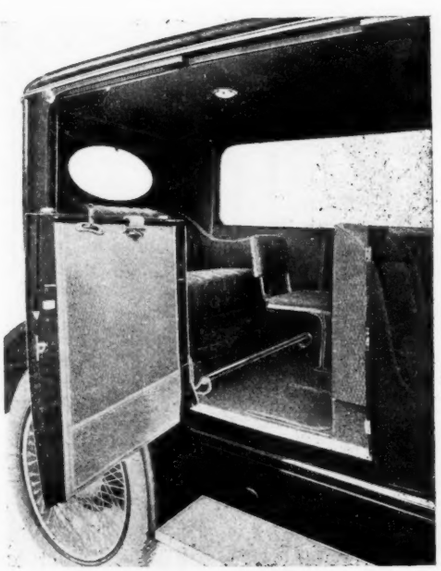


*New Liberty sedan. The door on the left side opens directly on the driver's seat, the rear door opening into the rear compartment. This permits the passengers to get in or out with a minimum of disturbance*



*The diagram of the new Jordan seven-passenger sedan reveals by the dimensions the care taken in its design to insure comfort to the occupants as well as the lower illustration brings out the severe simplicity of the car's exterior appearance. Note the slanting windshield. The price of the car is $2,650*



*Interior of the seven-passenger Jordan sedan, showing how neatly the foot rail for occupants of the rear seat is placed beneath the auxiliary seats*

# Erd Engine for Tractors Only

## Only One Model Made—Valve in Head Type—Develops 30 Hp. at 850 r. p. m. and 38 Hp. at 1200—Maximum Torque at 850

THE Erd engine, made by the Erd Motor Co., Saginaw, Mich., is produced especially for tractors and is made in only one size, this being 4 by 6 in., four cylinder. It is used regularly by several tractor manufacturers and is employed, among others, for the new model Bates Steel Mule. It has been designed with the burning of kerosene in view and has a manifold system suitable for this fuel; this being the main departure from conventional overhead-valve construction.

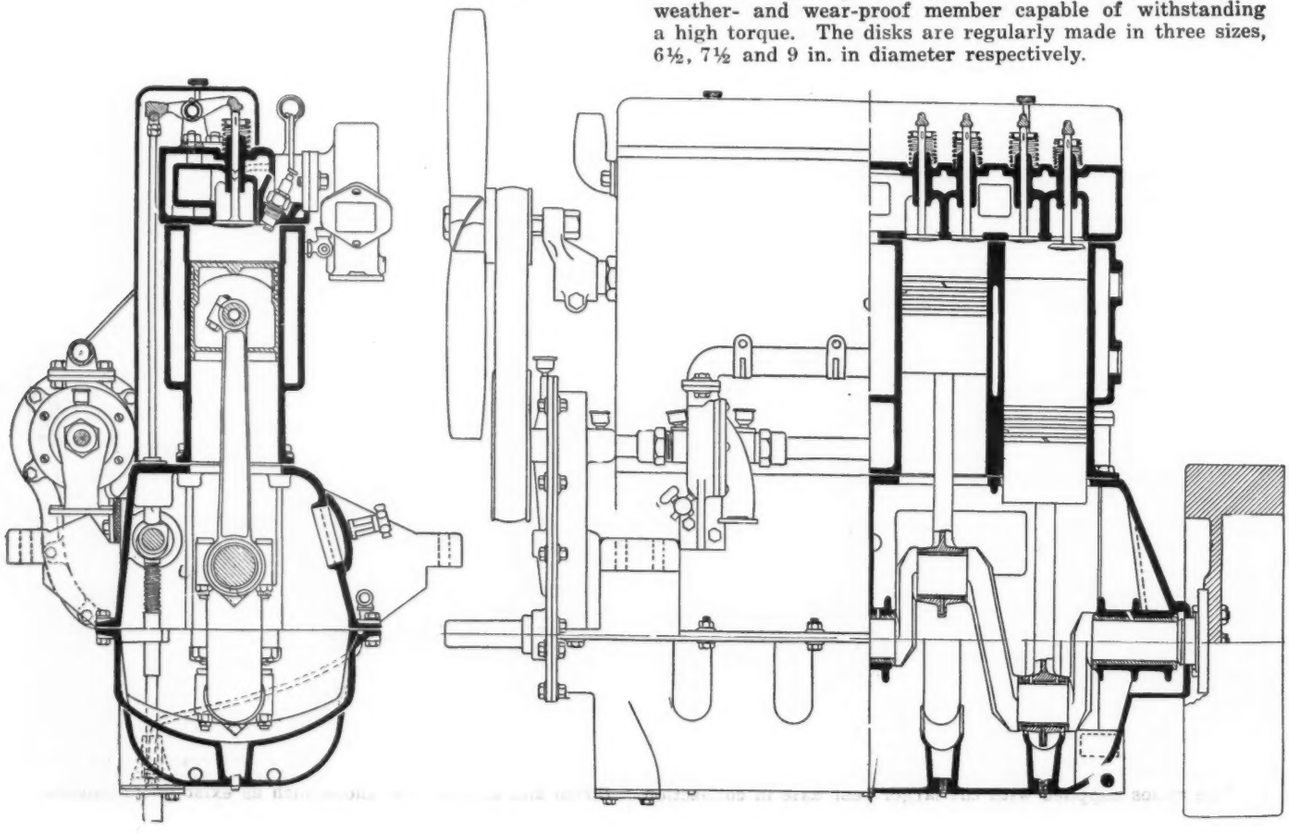
The underlying idea of the manifold is to have sufficient exhaust heating to prevent condensation as the mixture leaves the carbureter, and then to maintain the gas temperature by water jacketing. The carbureter used is vertical, and the bend of the passage leading into the cylinder head casting is integral with the exhaust manifold, thus the gas passes over a strongly heated surface while changing its direction of flow. Upon entering the head casting, the first part of the passage has exhaust-heated walls on either side and water-jackets above and below, this continuing right into the valve ports. It will be seen that the proportion of the passage which is water heated is much greater than the part receiving exhaust heat, and this should prevent overheating the mixture, which often happens when there is too much exhaust jacket.

In other respects the engine is a robust example of modern heavy duty types, and is mainly characterized by simplicity. There are four cast iron units, the head, cylinder barrel block, upper half and lower half of crankcase. In the side of the crankcase there is a large inspection door. The oil pump is a plunger type and is located in the lower half of the crankcase, being driven off one of the exhaust cams. Upon splitting the crankcase the pump comes away with it; in fact, nothing is interfered with in taking off the oil pan which can therefore be readily removed for cleaning.

A detail of the cylinders which is commendable is that the head is partly held on by studs screwed into the head, the nuts being accessible in pockets cast in the cylinder block on the manifold side. The purpose of this is to allow the spark plugs to be situated in the head, instead of in the cylinders, because the head location avoids the use of horizontally placed plugs.

Lubrication is by splash, the plunger pump feeding dip troughs. On the left side of the motor there is an auxiliary shaft driving the water pump and the magneto, and when a governor is required this is mounted on the right side and driven by belt from a crankshaft pulley.

The crankshaft is of 2 in. diameter on the main bearings, these being 3, 2½ and 4 in. long. The crankpins are 2 by 2¼ in. Either open or inclosed flywheels can be obtained, the weight of the former being given as 800 lb.

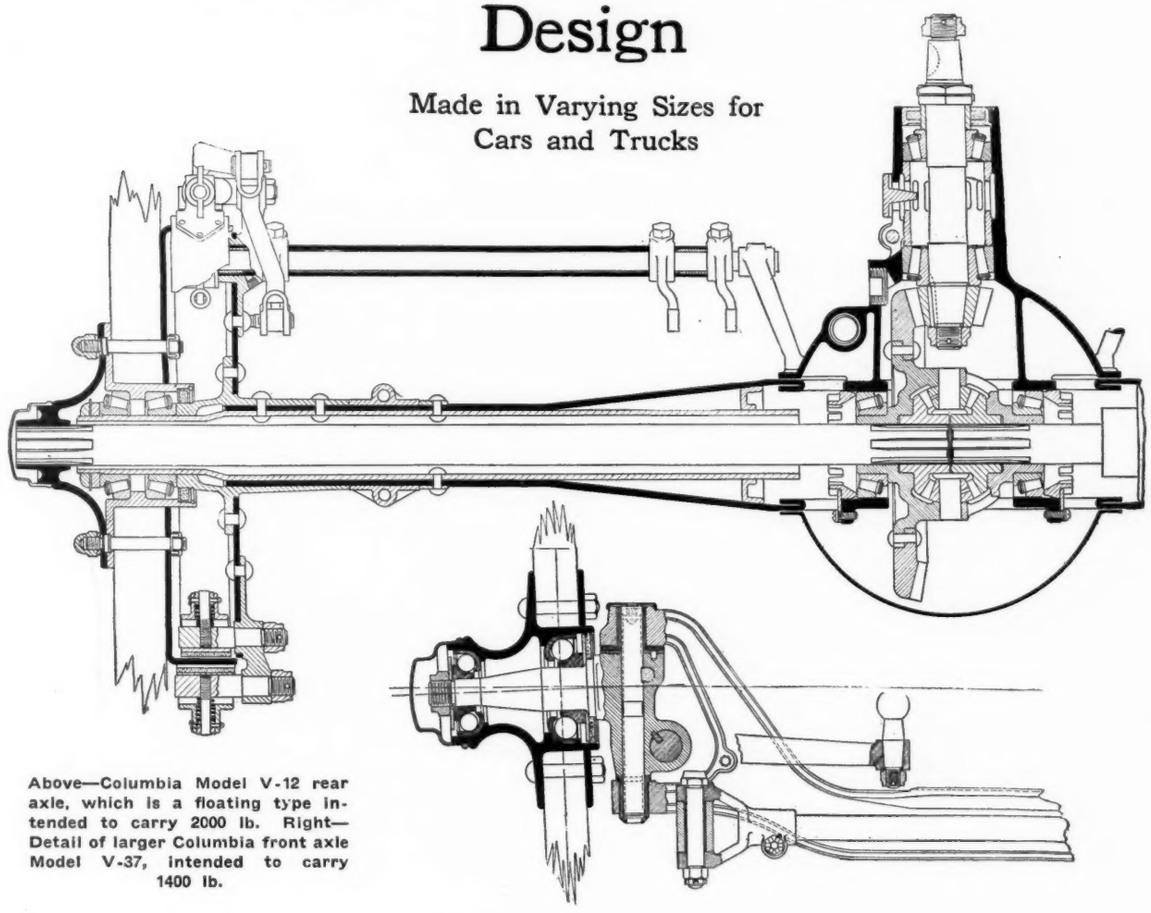


## Flexite Universal Joint Disks

F. R. BLAIR & CO., INC., New York, have placed on the market disks of fabric and rubber for use in flexible joints for driving magnetos, generators, etc., and for the regular universal joints of the power transmission line. The disks are composed of rubber, Sea Island cotton fabric and a reinforcement, the latter being so disposed as to reinforce the structure at the point of greatest strain. The whole is vulcanized under hydraulic pressure to form a tough, pliable, weather- and wear-proof member capable of withstanding a high torque. The disks are regularly made in three sizes, 6½, 7½ and 9 in. in diameter respectively.

# Columbia Axles of Standard Design

## Made in Varying Sizes for Cars and Trucks



Above—Columbia Model V-12 rear axle, which is a floating type intended to carry 2000 lb. Right—Detail of larger Columbia front axle Model V-37, intended to carry 1400 lb.

A LINE of automobile axles for cars weighing up to 3700 lb. and a front axle for trucks having 1 and 1½ tons capacity are built by the Columbia Axle Co., Cleveland. The car axles are made in two sizes, one for cars up to 3700 lb. and the other for cars up to 3000 lb. Both the front and rear axles are made for each of these sizes, and on the 3700 lb. car the total weight is divided up as 1700 on the front and 2000 on the rear. For the lighter cars weighing up to 3000 lb. the weights are divided 1400 lb. front and 1600 lb. rear. There is no rear axle made by the Columbia company to go with the truck front axle. The larger axle is full-floating and the smaller, semi-floating.

The front axles are the conventional I-beam design, made from a forging of 0.40 carbon steel. The steering arms and knuckles are of the same material, and all these parts are double heat-treated except the steering arms and spindles of the 1-ton truck front axle, which are of chrome nickel steel. The king pins and bushings are steel, hardened and ground. The steering cross rod pin is also hardened and ground and works in a bronze bushing.

On the larger pair of axles which are known as Model V-11 for the front and V-12 for the rear, the equipment is Bock taper roller bearings throughout. On the smaller rear axles there is a combination of Bock taper rollers and Hyatts. The smaller front axle, known as V-37, has cup and cone bearings. The truck front axle is known as Model V-74 and is furnished with either Bower bearings, as shown, or Bock taper rollers. All the front axles are fitted with the Elliott type of steering knuckle.

The ratios supplied with the larger rear axle in connection with five-pitch gears are, 12 to 53, 12 to 55, and 11 to 55. With 4.6 gears the ratios are 11 to 49 and 12 to 49. On the smaller rear axle with 5-pitch gears the ratios are 12 to 53, 12 to 55, and 11 to 55. On these rear axles the hubs and pinion shafts are provided with felt washers to guard against leakage of grease. Adjustment is provided for taking up the wear on all the taper roller bearings, while the Hyatt and Bower, of course, have no such provision.

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## Field for Tractors in Brazil

A LARGE foreign market for the tractor, should the American manufacturers get in position to supply the demands for tractors, may be found in Brazil, as the present prosperity of Brazil has led to a renewed interest in modern agricultural methods and to a demand for all sorts of American farm machinery and implements, according to a report on the subject by the Bureau of Foreign and Domestic Commerce, of the Department of Commerce. It is expected that the industrial and agricultural revival that has taken place in Brazil since the first period of depression that followed the outbreak of the war will make itself felt for many years to come.

Agricultural conditions in each of the Brazilian states are described at length in the report entitled, Markets for Agricultural Implements and Machinery in Brazil, Special Agents Series No. 140, and the point is made that small farms and intensive cultivation are the rule rather than very large farms and extensive methods such as exist in Argentina.

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# Control Layout

FROM time to time this publication has expressed itself as decidedly in favor of any movement which will give greater comfort to the man who drives his own car. In such a large percentage of cases the American car owner is the man who drives that it is logical that anything which will make motoring more attractive for him should be carefully fostered.

In our consideration for manufacturing possibilities we are more or less prone to look at the possibilities for economic production on a large scale first and the comfort of drivers or passengers as secondary. As a matter of fact, the reverse ought to be the order of consideration and it is so in a great many of the factories. There have been some changes in this matter in the past few months in some cars which needed improvement, but there is still room for a change in a great many others.

It ought to be the first consideration with the designer of a car that the man who drives can comfortably and safely manipulate the devices which are given him to control speed and direction. This will necessitate compromises in a great many instances between the exact lines selected as most beautiful by the body man and the locations best liked by the production manager. For a concern that is striving to secure a low chassis it will give difficulties in one direction while those trying to get a decided stream line effect will meet their difficulties in other ways.

There ought never be a car delivered on which the owner is not able to put his foot quickly on the clutch pedal without striking his leg against the steering wheel. Quickness in declutching is often necessary in traffic to prevent accident. If that part of the leg just above the knee strikes the bottom of the steering wheel when the foot is raised, it prevents quick action.

Another point which should be considered is the position of the foot on the accelerator pedal. This should be straight and not tilted, regardless of the position of the pedal. It will tire any driver to keep his foot tilted for hours at a stretch, putting an excessive strain on the cords of his ankle. The point where the break in the windshield meets the sight line of the eye, the reach for the shifter lever, the possibility of interference between brake lever and emergency and the possibilities of comfortably locating the left foot when driving with the hand on a straight, level road are all of consequence and should be studied by the man who lays out an automobile control system.

# Single-Power Submarines

A SWISS publication prints an item to the effect that German engineers have solved the problem of running submarine boats on internal combustion engines while submerged, thus doing away with electric generators and storage batteries. It is the necessity of carrying a double power plant, one for use on the surface and the other for use when submerged, which has limited the speed of submarines.

The reason why it is difficult to operate an internal combustion engine on a submarine while submerged is that it consumes an enormous volume of air for burning its fuel and produces a substantially equal volume of exhaust gases. The material on which the engine operates is in the gaseous state, both in entering the engine and upon leaving it, and its bulk is therefore very great. About three-fourths of the matter passing through an engine is inert, however, and undergoes no change in the engine other than being raised in temperature. This is the nitrogen of the air which constitutes 79 per cent of the atmosphere. Undoubtedly this nitrogen is necessary as a diluent in the charge of an engine, because if a charge made up of pure oxygen and hydrocarbon fuel were admitted to the cylinders the heat generated would be so intense as to injure some of the working parts of the engine. But as the nitrogen is in exactly the same chemical state on leaving the cylinders as when entering them, it can be used over and over, all that is necessary being to cool it so it will not dilate the ingoing charge too much.

### Fuel and Oxygen Not Removable

In the exhaust products the nitrogen is mixed with carbonic acid gas and water vapor, both of which are combinations of a part of the fuel with oxygen. It is impossible in a practical sense to recover any of the fuel, and it is equally impossible to

recover any of the oxygen, because it is the heat of combination of the fuel with the oxygen that furnishes the power, and before any fuel or oxygen be recovered the products of combustion would have to be decomposed into their elements, which would require as much heat as they give out in combining. Consequently both the fuel and the oxygen can be passed through the engine only once.

In order to make it practical to operate an internal combustion engine in a submarine while submerged it is necessary, however, to dispose of the exhaust in some other than the usual way. The so-called under-water exhaust employed on motor boats is impractical, because it would clearly indicate the position and path of a submarine when only slightly submerged, and it would offer excessive back pressure when deeply submerged. The exhaust gases cannot be retained inside the vessel in the gaseous form, because there would not be enough room. Of course, if the nitrogen is used over and over only the water vapor and carbonic acid gas must be disposed of, and these must first be separated from the nitrogen.

### Disposal of Products of Combustion

The water vapor can be readily condensed out by merely cooling the exhaust products sufficiently. Carbon dioxide gas is readily absorbed by lime water, the calcium hydrate of which is changed to calcium carbonate.

For every pound of hydrocarbon fuel burned about 3½ lb. of oxygen is consumed and about 3 lb. of carbonic acid gas produced. To absorb this carbonic acid about 5 lb. of lime is required. Therefore, for every pound of fuel burned below the surface of the water it would be necessary to carry 8½ lb. of other material. This does not take account of the fact that the oxygen would have to be carried either in a highly compressed or in the liquefied state, in either of which cases it would require very strong steel flasks to hold it, which would probably be nearly as heavy as the oxygen itself. Also, the lime has to be dissolved in water in order to be able to absorb the carbonic acid, which would add further to the weight to be carried.

In a Diesel engine the fuel consumption is about ½ lb. per horsepower-hour. Not counting containers the supplies required for producing 1 hp.-hr. submerged therefore weigh 9 lb.

### The Oxygen Supply

There are two possibilities with respect to the necessary supply of oxygen. Either the whole supply required for a trip can be taken along from the base, or else oxygen can be extracted from the atmosphere while cruising on the surface by means of an air liquefying apparatus. The former method would have the advantage of leaving all the power of the machinery for the sole purpose of propulsion, thus permitting of higher speed. But it would require carrying sufficient oxygen for all submerged operation during a complete trip. It is not at all unlikely that either method would possess advantages over the use of storage batteries and electric motors for submerged operation. A number of problems would have to be worked out, such as the best method of quickly cooling the exhaust gases and absorbing the carbon dioxide. These, however, should present no insurmountable difficulties.

While it may thus be possible to increase the speed and the radius of action of submarines by adapting them to be operated by their Diesel engines while submerged, only slight gains could at best be hoped for, because the additional supplies and apparatus required to make it possible to operate the engines below the surface of the sea would largely make up for the elimination of the batteries and electrical machinery. These latter weigh about 100 lb. per horsepower-hour, or 200 times as much as the fuel producing an equal output of energy in a Diesel engine.

## The Ban on the Cut-Out

A WORD of commendation is due the National Automobile Chamber of Commerce for its decision to abandon the practice of fitting cars with muffler cut-outs. It is not to be expected that this decision will entirely eliminate the cut-out, as owners may still buy the device and have it fitted to their cars. However, a great many owners of cars will agree with the manufacturers that a cut-out is unnecessary, and consequently this much-abused device will gradually become less common on automobiles.

### Mufflers and Power Loss

Originally the muffler cut-out was fitted in order to permit of increasing the power of the engine under certain conditions. With the inefficient mufflers in use from 10 to 15 years ago and the general deficiency in power of cars of that period, the cut-out was a real help. In respect to the inefficiency of the early mufflers it may be pointed out that muffler trials held in Paris in 1905 showed that the really efficient mufflers (from a silencing point of view) absorbed from 10 to 11 per cent of the engine power. But tests conducted at the University of Michigan in 1914 showed that very good muffling effects could be obtained with a power loss of only 3 per cent. This applies only to operation under full throttle; at partial loads the loss in the muffler is even less.

Besides increasing the power the muffler cut-out served the purpose of enabling the driver to tell whether his engine fired regularly in all cylinders. Such a test, however, is required only at long intervals and the purposes can be served by a plug, plate or valve in the exhaust pipe without operating connection to the driver's seat.

### Cut-Out Too Frequently Abused

There has been entirely too much abuse of the muffler cut-out. Popular resentment created thereby is reflected in numerous laws and ordinances forbidding the use of the device. The muffler cut-out would undoubtedly have been dropped earlier by some manufacturers had it not been for the rivalry among them in respect to offering a long list of equipment, and the cut-out could be added at very little cost.

# News of the Automotive Industries

## S. A. E. Plans Winter Meetings

### Two and Probably Four Sessions To Be Held — Chicago To Have Meeting

WASHINGTON, Sept. 10—Definite plans were adopted regarding the winter meetings of the Society of Automotive Engineers at the meeting of the council of the society held here to-day. The major winter activities will center in the New York and Chicago show weeks. Plans are for at least two and probably four winter meetings.

During the New York show week there will be a 2-day session—Wednesday and Thursday, Jan. 9 and 10. Wednesday, Jan. 9, will be standards day, and will be known as such. Thursday, Jan. 10, will be known as S. A. E. day of show week. There will be a business session in the morning, a professional session in the afternoon and a War dinner at night.

**The Chicago Session**

For the first time Chicago will be on the S. A. E. winter map, as there will be an engineering session either Wednesday or Thursday of Chicago show week, followed by a large Patriotic dinner in the evening. Undoubtedly questions of farm tractor design will form a big part of the engineering session.

In addition to these two major winter meetings there will be at least two special sessions held in New York, one on aviation and the other on motor boats. The aviation meeting will be held during the aviation show, and the motor boat meeting will be held during the week of the motor boat show.

**Programs Patriotic**

Programs at all of the meetings will be largely patriotic in nature and similar to the June meeting in this city. It is contemplated making the War and Patriotic dinners in New York and Chicago very popular and medium priced and to get the best national talent available for the after-dinner talks.

The S. A. E. membership is constantly growing. Since the last meeting of the council on June 25, there have been received 247 applications for membership. The present membership is 2775. Over 200 applications were passed upon to-day and there are over 200 more being prepared for the next meeting of the council.

Numerous activities in connection with the standardizing work of the society were started. Three new divisions of the standards committee were formed, namely:

(a) Stationary and Farm Engine Division.
(b) Motorcycle Division.
(c) Fuel and Lubricant Division.

In addition the Chain Division was reorganzed.

H. L. Horning was appointed chairman of the Fuel and Lubricant Division and with him on the committee are:

H. G. Chatain, engineer gas engine department General Electric Co.; Charles W. Stratford, oil chemist, Platt & Washburn Refining Co., and W. F. Parish, Texas Co. W. C. Keys, Standard Parts Co., was added to the Miscellaneous Division of the standards committee.

Charles Kratsch of the Sumter Electrical Co., Chicago, was appointed chairman of the newly-formed Stationary and Farm Engine Division.

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**1200 Kelly-Springfield Trucks Purchased by Signal Corps**

WASHINGTON, Sept. 11—Twelve hundred Kelly-Springfield trucks have been purchased by the Aviation Section of the Signal Corps. The trucks will be used at the aviation training camps.

—

**Tire Prices Continue to Rise**

NEW YORK, Sept. 12—As was expected, an upward movement in tire prices has followed last week's lead taken by six of the largest makers. Increases ranging from 5 to 10 per cent and tube prices remain stationary. A few of the prominent tires still remain unchanged in prices, such as Kelly-Springfield, Pennsylvania and Lee. On the other hand, Republic, Victor, Star, Peerless, Mohawk and Michelin have gone up 10 per cent on pneumatics. Globe has gone up 7½ per cent to-day. Republic has raised its truck tire prices 15 per cent. The rise on Star tires will occur Sept. 12. Miller will raise prices 10 per cent on Sept. 15.

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**Elgin Joins N. A. C. C.**

NEW YORK, Sept. 8—The Elgin Motor Car Co. has been elected to membership in the National Automobile Chamber of Commerce.

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**Columbia Is $45 Higher**

DETROIT, Sept. 10—The Columbia Motors Co. has increased the price of its car $45, making the touring car $1,295.

—

**Von Rosen Resigns from Saxon**

DETROIT, Sept. 12—E. E. Von Rosen has resigned as treasurer and director of the Saxon Motor Car Corp. He has made no announcement yet as to his future plans.

## U. S. Aero Engine a Success

### Twelve-Cylinder Exceeds All Expectations in Tests—Others Highly Satisfactory

WASHINGTON, Sept. 11—The standardized U. S. aviation engine which the industry has known for 3 months has been under development in Washington, but facts regarding which cannot be published on the ground that it would be giving valuable information to alien enemies, has been undergoing tests for nearly 6 weeks. These tests have been highly satisfactory, and one of the designs, namely, the twelve-cylinder type, has exceeded the expectations of the designers and others connected with the aircraft work. Capt. Howard Marmon, recently returned from Europe, where he represented the Government in investigating aviation matters, declares that the U. S. standardized motor is on a par with the fighting machines in Europe which are intended to fill a similar field.

As previously suggested in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES the U. S. aviation motor was designed with two points especially in mind, namely, standardizing to the last limit and designing everything for rapid production. With this object in view the four designs included four-cylinder, six-cylinder, eight and twelve with the maximum of parts in all four interchangeable. Thus, the single Ford cylinder can be used on any one of the four models. The same applies to the valves, valve action, camshaft drive, pistons, parts of manifolds and many other parts. The interchangeability is such that a twelve can be made from an eight with the addition of very few parts. A six can be produced from a four with very few different parts such as crankcase, crankshaft, camshaft and a few other parts which naturally must be different in a six as compared with a four.

**Twelve Tested First**

At present, although the standardized motor has been seen by hundreds in the industry, few facts are given out for publication by the Aircraft Production Board. The twelve-cylinder model was first developed and tested. In the development of this the work was started just before the middle of June, so that the first completed motor was assembled on July 4, scarcely 30 days being required from the conception of the plan until the motor was assembled in Washington. There was a little revision in some de-

(*Continued on page* 473)

# German Air Forces Reorganized

## Improved Machines Built To Succeed One Another at Short Intervals

NEW YORK, Sept. 8.—According to an article in the Paris *Temps* the German air forces have been completely reorganized since the battle of the Somme, the re-grouping and re-equipment having been accelerated, it is said, by the entrance of the United States into the war. There are now four divisions of the German air forces, made up as follows:

1. Army squadrillas or "army fliers division," which are directly under the command of the army chief of aviation and the work of which consists mainly of expeditions far to the rear of the lines. They are employed for bombardments, night flights and photographic work.

Prisoners say that a recently constructed biplane of the Albatross type is vastly superior to anything heretofore used by these squadrillas. It is equipped with a 260 hp. motor and attains a speed of from 100 to 115 m.p.h. It can rise to an altitude of more than 6000 ft. in nine minutes and carries two machine guns. The machines travel in groups of six or eight.

2. Corps squadrillas or "troop fliers" which are attached to the staff headquarters of the armies and are commanded by captains. These generally remain within the sector to which they are attached and are used for reconnoissances, photographing trenches, batteries and making patrol flights.

3. Hunting squadrillas are the main attacking instruments of the German air forces, and for chasing enemy machines which venture over their lines.

On the west front there are about forty of these squadrillas, with about a dozen machines to each. Others in the same category have as their duty the protection of the large German cities that lie within airplane flight of the French and English, such as Strasburg, Freiburg, Mulhouse, Friedrichshafen, Stuttgart, Essen, Cologne and Treves. The pilots are chosen from among the best of the German aviators.

4. Battle squadrillas or "flotillas" are under the direction of great headquarters, and shift from army to army to carry out bombardments on military establishments behind the front.

There are from forty to fifty machines in each squadrilla,. divided into four or five sections. Each airplane is armed with two machine guns and carries bombs weighing from 20 to 100 pounds. Some are said to carry bombs that weigh more than 200 pounds.

While perfecting their service in the air, the Germans have also bettered their anti-aircraft measures and weapons. The 77-millimeter guns have given way to rapid-firing guns of 105 millimeter caliber, and at certain points along the front they use shrapnel guns of 240-millimeter size.

The Germans ,it is said, are constantly putting new types of machines into the field. The Taube went out of style long ago, and it has now been followed by the Fokker. Its inventor, a Dutchman, is now said to be devoting himself to the perfection of a machine with a 260 hp. engine.

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### Major Alden Off to War Zone

NEW YORK, Sept. 12—Major H. W. Alden of the Ordnance Department, Washington, and formerly of the Timken-Detroit Axle Co., sailed for Europe recently, where he will study the motorizing of heavy war units for the Ordnance Department.

—

### $80,000,000 Government Orders for Detroit Makers

DETROIT, Sept. 12—Two Government purchasing agents have left here for Washington following inspection of local plants with a view to placing orders. One reported that the Government has prepared a purchasing program for airplanes and trucks on a 4-year scale. Government orders for airplanes, amounting to $80,000,000, have been placed in Detroit in the past week.

One automobile company received a $50,000,000 order and another has a $30,000,000 order. A truck manufacturer received an order for $16,000,000 worth of trucks. An airplane body maker received an order covering a period of several months amounting to $4,000,000 per month.

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### Ford May Pay $15,000,000 Excess Profits Tax

DETROIT, MICH., Sept. 12—It is estimated that automobile makers will pay $45,000,000 excess profits tax of which the Ford Motor Co. will pay about $15,000,000.

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### Lincoln Acquires Land

DETROIT, Sept. 10—The Lincoln Motor Co., organized recently by W. C. Leland and Henry M. Leland, as was told in a recent issue of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES, has acquired 30 acres of land and will add new buildings as additional units to the present plant. The company anticipates that a production schedule will start by Oct. 1. The Packard Motor Co. and the Lincoln Motor Co. are making complete airplane engines for the government.

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### Airplane Workers Exempted

WASHINGTON, Sept. 8—Owing to the unusual demand for aeronautic workers by the government, an executive order has been issued waiving civil service rules as regards this class of experts.

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### Partin-Palmer Now Commonwealth

CHICAGO, Sept. 10—The Commonwealth Motors Co. has discontinued the use of the name Partin-Palmer. Its products are hereafter to be styled Commonwealth.

# Girl Concentrates on Army Trucks

## President of Standard Parts Co. Takes Quarters in Washington—Utz in Same Work

WASHINGTON, Sept. 11—Each week sees the colony of automotive engineers here increasing, and each addition to the ranks of engineers working for the Government in the various arms of the service convinces the onlooker that not only good work but excellent progress is being made. Last week one of the leaders in the automobile parts and components field was added to the present quota when Christian Girl, president of the Standard Parts Co., Cleveland, decided to locate temporarily in Washington and to confine all his efforts to the production end of the new military trucks. Mr. Girl will work with the Military Truck Committee, having production work specially in mind. He has taken quarters in the LaFayette Hotel and has left the management of the Standard Parts Co., made up of its five components, entirely to his Cleveland organization. He is now working for the Government, donating his time and paying his own expenses. Mr. Girl is particularly well qualified to act in this special field, as there is no other person in the parts industry closer to the metal markets, or who has made a more careful study of them since the beginning of the war. His work of looking into the materials situation as related to the military truck coupled with his production knowledge should prove a valuable aid in accelerating production of the two models.

J. G. Utz, chief engineer of the Standard Parts Co., will also locate here to devote his time to standard army truck development. Mr. Utz is chairman of the standards committee of the Society of Automotive Engineers and has been prominent in its standards work for years. His experience, ability and engineering knowledge should be very effective in combination with the work of Mr. Girl.

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### Continental Has Large War Contracts

DETROIT, Sept. 10—The Continental Motors Corp. has orders for thousands of engines for ambulances and trucks for the medical, signal and aviation divisions of the army.

The company had net earnings of 10 per cent on the common stock after deducting the sinking fund requirements and preferred dividends, and on this showing will earn $2,000,000 for the year.

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### 40,000 Ford Trucks for Government

DETROIT, Sept. 11—Representatives of the Ford Motor Co. are visiting the Bay City Auto Co., Bay City, Mich., to consult with the company in regard to a large contract for bodies for Ford trucks for Ford's government contract for 40,000 trucks.

# Normal Conditions in Cleveland

## Slump Experienced by Manufacturers Has Given Way to Improvement in Business

CLEVELAND, Sept. 10—Business conditions in Cleveland in the automobile industry foretell a manufacturing season for the coming Fall and Winter that should be better than normal. This is based on the statements of some twenty leading manufacturers of cars and accessories in this territory and upon the reports of dealers representing these concerns in different parts of the country.

The Willard Storage Battery Co. now has on hand more than the normal amount of business and is just about to start on a production schedule of 6000 batteries per day. The Torbensen Axle Co. is another trade barometer. The present capacity of the plant is taxed to the utmost and an addition which will be completed in about 3 weeks will be immediately occupied and pushed to its fullest extent.

The complete car companies such as Chandler, Grant, White, Jordan, Peerless, Hal, Stearns and Abbott are all swinging back into their stride. Chandler will make 17,000 cars during the present fiscal year. Grant is getting back to 1000 a month. Jordan, only a year old, is going ahead on a ten-a-day schedule, and the other concerns are similarly up to full capacity.

The Standard Parts company recently formed by the merger of the Perfection Spring, Standard Welding and a number of other concerns is just about to take a hand in the tractor industry and will supply such parts as the bands for the steel wheels, springs, axles, Bock roller bearings, yoke ends, etc. The deal with the American Ball Bearing Co. is practically complete and business is proceeding under the unit organization.

Cleveland will also be an important center in the airplane industry. The entrance of the Mather Spring-Steel Products organizations into this field with Glenn Martin assures the city of a giant airplane plant, and in fact the plant is already well under way and it is certain that a large percentage of the Government's work on airplanes will be turned out in Cleveland.

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### Government to Encourage Use of Trucks for Short Hauls

WASHINGTON, Sept. 12—A more extended use of trucks for short hauls in order to relieve railroad congestion is to be encouraged by the storage committee of the Council of National Defense. The main object of the storage committee is to arrange means whereby manufacturers having large government contracts may deliver to nearby government stores as fast as they produce, instead of perhaps loading their product into freight cars which will stand idle until such time as the goods are required at their final point.

For instance, one western factory has at present an enormous supply of stuff for cantonments in hand which are not yet wanted at the different points. Similarly, the motor trucks now being produced in Detroit are not needed for shipment one by one as they are completed. The scheme will be to have a government warehouse near each center of production so that manufacturers send their goods to this place and receive payment for them. For delivery from factory to warehouse it is suggested that trucks should be used wherever possible.

It is also thought that considerable railroad congestion could be saved if manufacturers not working for the Government would use trucks for short hauls.

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### BIG TRACTOR SHOW FOR TEXAS

DALLAS, Sept. 10—What promises to be one of the biggest tractor and accessory exhibitions ever seen in Texas will be at the Texas State Fair Oct. 13 to 28. There will be daily tractor demonstrations. Plans are under way whereby lessons to the farmers may be given in plowing, planting, etc. It is expected that thousands of farmers over the Southwest will witness the demonstrations. Those taking space are:

Albert Lea Tractor Co., Albert Lea, Minn.; Avery Co., Peoria, Ill.; Aultmann & Taylor Machinery Co., Milwaukee; Allis-Chalmers Mfg. Co., Milwaukee; Albaugh Dover Mfg. Co., Chicago; B. F. Avery & Sons, Louisville; the Buckeye Mfg. Co., Anderson, Ind.; Bull Tractor Co., Minneapolis; Bullock Tractor Co., Chicago; Big Four Drive Co., Big Rapids, Mich.; C. I. Case Co., San Leandro, Cal.; J. I. Case Threshing Machine Co., Racine; J. I. Case Plow Works, Racine; Cleveland Tractor Co., Cleveland; C. O. Tractor Co., Minneapolis; the Common Sense Gas Tractor Co., Minneapolis; Collins Plow Co., Quincy, Ill.; Dayton Dick Co., Quincy, Ill.; Deuch Mfg. Co., Sandusky, Ohio; Dearing Co., Moline, Ill.; Dunham Co., Berea, Ohio; Electric Wheel Co., Quincy, Ill.; Elgin Tractor Corp., Elgin, Ill.; Emerson Brantingham Implement Co., Rockford, Ill.; Farm Horse Tractor Co., Hartford, S. D.; Four Drive Tractor Co., Big Rapids, Mich.; Gain Belt Tractor Co., Minneapolis; Gard Detour Plow Co., Dixon, Ill.; Gile Tractor and Engine Co., Ludington, Mich.; Gray Tractor Co., Minneapolis; Hart Parr Co., Charles City, Iowa; Huber Mfg. Co., Marion, Ohio; Hoke Tractor Co., South Bend, Ind.; Hansman Mfg. Co., Long Prairie, Minn.; Holt Mfg. Co., Peoria, Ill.; International Harvester Co., Chicago; Interstate Engine and Tractor Co., Waterloo, Iowa; Joliet Oil Tractor Co., Joliet, Ill.; Janesville Machinery Co., Janesville, Wis.; Kardell Tractor & Truck Co., St. Louis; Kinnard Haynes Co., Minneapolis; La Crosse Tractor Co., La-Crosse, Wis.; John Lauson Mfg. Co., New Holstein, Wis.; Lyons Atlas Co., Indianapolis; the McIntyre Mfg. Co., Columbus; Minneapolis Steel & Machinery Co., Minneapolis; Monarch Tractor Co., W. Watertown, Wis.; Moline Plow Co., Moline, Ill.; New Age Tractor Co., Minneapolis; Nelson Tractor Co., Minneapolis; Oliver Chilled Plow Works, Omaha; Parlin & Orandorff Implement Co., Canton, Ill.; Parrett Tractor Co., Chicago; Peoria Tractor Co., Peoria, Ill.; Pioneer Tractor Co., Winona, Minn.; Simplex Tractor Co., Minneapolis; Stinson Tractor Co., Minneapolis; Lee Motor Corp., Moline, Ill.; Vulcan Plow Co., Evansville, Ind.; Waterloo Gasoline Engine Co., Waterloo, Iowa; Waite Tractor Co., Chicago, Ill., and the Wallace Tractor Co., Racine, Wis.

Accessory dealers: Balso Oil Co., Toledo; Buda Motor Co., Harvey, Ill.; Byrne Kingston Co., Kokomo, Ind.; Climax Spark Plug Co., Toledo; Climax Engineering Co., Clinton, Iowa; Doman Motor Co., Oshkosh, Wis.; Diamond Chian Co., Indianapolis; Eisemann Magneto Co., New York; Erd Motor Co., Saginaw, Mich.; Holly Brothers Co., Detroit; Hyatt Roller Bearing Co., Chicago; K. W. Ignition Co., Cleveland; Keystone Lubricating Co., Philadelphia; Malty Auto Specialty Co., Detroit; Pierce Governor Co., Anderson, Ind.; Standard Oil Co., Omaha; Sumpter Electric Co., Chicago; Timken Roller Bearing Co., Canton, and the Vacuum Oil Co., Clinton, Iowa.

# Chevrolet To Make Tractors

## Parts Made in Canadian Plant of Company To Be Free of Duty

DETROIT, Sept. 7—The Chevrolet Motor Co., of Flint, Mich., plans to enter into tractor manufacture, according to advices received here from Washington. The Secretary of the Treasury has allowed certain parts made in Canada by the Chevrolet Canadian factory to be admitted free of duty upon representation that the importations were to be used by the Chevrolet company to make tractors. The ruling was sought and obtained by E. O. Wood of the Chevrolet Motor Co.

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### New Jersey Tractor Demonstrations

NEWARK, Sept. 11—It is announced by the State Commission on Mechanical Power in Agriculture that fifteen tractor dealers have agreed to take part in the demonstrations to be held on the lands of the Walker-Gordon Laboratories Company, Plainsboro, on Sept. 18, 19 and 20. Arrangements have been made to allow each exhibitor a definite place of land on which to demonstrate to prospective customers the availability of the tractor to meet New Jersey conditions. Public demonstrations will be held during the afternoons only.

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### Jumbo Spark Plug Plant Moved

BOSTON, Sept. 12—The Gibson-Hollister Manufacturing Co. has moved from Boston to a new plant in Springfield, Mass. This change of location is made necessary by the rapidly-growing demand for Jumbo spark plugs, Croxford rim tools and the electrical connections and switches manufactured by this company.

Increased trade has in the past 2 years forced this company three times to increase its manufacturing facilities. At present the entire new plant capacity will be devoted to the manufacture of Jumbo spark plugs in the new non-rustable "Noncoro" finish and a special aviation type spark plug, which has just been developed.

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### Ford Tractor Production at Present Only for English Government

DETROIT, Sept. 8—Henry Ford & Son will be unable to place the Ford tractor on the open market for some time, according to Henry Ford, because of the large contract the company has with the English government. Mr. Ford has promised to send the first tractor made to Luther Burbank in California.

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### Ford Reduces Sociological Staff

DETROIT, Sept. 12—The advisory staff of the Ford Motor Co. sociological department has been reduced from 150 to fifty men. This is not due to a change in the profit sharing system but because of increased efficiency of the department.

# G. M. Profits Total $30,000,000

## 34% on Common Stock — 18,340 Cars and Trucks Sold in August

NEW YORK, Sept. 8—The General Motors Co. during the fiscal year ended July 31 showed net profits amounting to approximately $30,000,000, comparing with $28,789,560 in the 1916 fiscal year, and after allowing for the 6 per cent dividend on the $20,000,000 preferred stock is equal to about 34 per cent on the common stock outstanding.

The output in the year just closed was 185,000 cars, and plans are arranged for the coming year for the production of upwards of 250,000 cars by the General Motors companies.

The company has at present approximately $15,000,000 cash on hand, and its plants are operating to capacity.

August, which launched General Motors on its 1918 year, showed sales of 18,340 cars and trucks, compared with 11,056 cars in August, 1916, a gain of 6284 cars, or 55 per cent. These sales, not production figures, are at the rate of 217,000 cars a year compared with output for fiscal year ended July 31 of but 185,000.

Every unit is outdistancing last year's sales records. Buick is first with sales of 10,874 for August compared with 8461 a year ago.

Notwithstanding factory readjustments incidental to new models, Buick is producing 530 cars a day and expects to bring this up to 600 before the week is over.

Oldsmobile ranks second in sales with 2773 compared with 786 a year ago. Oakland sales are running practically 25 per cent ahead of a year ago. Its August total was 2668 against 2133 in 1916. Cadillac sales for August registered 733 cars against only ninety-nine a year ago.

By reason of Government purchases General Motors Truck Co. shows a gain in business footing up almost 400 per cent. August sales were 1069 trucks compared with 235 in 1916.

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### New Moon Six at $1,095

ST. LOUIS, MO., Sept. 8—The new six-cylinder model in touring and roadster form brought out by the Moon Motor Car Co. is called the 6-36 and will sell at $1,095. The car follows standard Moon practice, the only change in appearance being that the slope of the line from the radiator to the dash is a straight line. Production started Sept. 1 and prices for closed bodies mounted on the same chassis are to be announced soon. Wheelbase of the chassis is 114 in.

The Continental Red-Seal engine used is 2⅞ by 4½ with the cylinders cast in a unit and pump cooling has been replaced on this model by thermo-syphon. Ignition is Delco and the carbureter is a double-jet Tillotson. Gasoline is fed by gravity to the carbureter from a 12 gal. steel tank placed in the cowl. Oiling is by force-feed and splash. Starting and lighting are by the Wagner two-unit, 6-volt system, with Bendix starter drive.

The transmission provides for three speeds forward and one reverse. The rear axle is equipped with Timken roller bearings throughout and the drive is taken by bevel gears spirally cut. The rear axle is semi-floating and the drive, which on other Moon models has been through the Hotchkiss form of construction, has been replaced by a long third member terminating in a yoke at the forward end of the drive shaft.

Tires are 32 by 3½ in. Wire wheels will be furnished at an extra price.

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### Muskegon Engine Loses Patent Rights

MUSKEGON, MICH., Sept. 12—The Muskegon Engine Co., formerly the Universal Four-Cycle Valveless Engine Co., has been notified by J. A. Anderson, of Clark & Anderson, that it has forfeited its rights to make Clark-Anderson engines under the Clark-Anderson patents, and that the contract between the two parties has been cancelled. Clark & Anderson are now negotiating with a large Grand Rapids maker to manufacture under their patents and stockholders of the original company may form a closed company to manufacture the engine.

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### Packard Announces Third Series With 10 Styles of Closed Bodies

DETROIT, Sept. 10—The Packard Motor Car Co. has brought out its third series line of Packard twin sixes with ten styles of closed cars. All types of these except a coupe and the new six-passenger brougham may be had in two lengths of wheelbase. The line includes limousine, imperial limousine, landaulet, coupe, brougham for seven passengers with no partition and individual front seats with an aisle between, brougham for six passengers with the top lower than on the other closed cars and with a straight-line roof effect.

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### New Lexington Six $1,585

CONNERSVILLE, IND., Sept. 12—The Lexington-Howard Co. has brought out the new Lexington Minute-Man-Six model selling at $1,585. In every way it is larger than the other offerings, having a 122 in. wheelbase and a five-passenger body. Another feature is the frame, which has eliminated, it is stated, 126 separate parts found in the ordinary frame. Instead of necessary parts being bolted on frame, all of these parts are welded directly on to the frame and become an integral part of it. Another feature is the emergency brake which engages on the propeller shaft directly behind the transmission.

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### Fulton Continues 1½-Ton Truck

FARMINGDALE, L. I., Sept. 8—The Fulton Motor Truck Co. will continue its one model, the 1½-ton Fulton. The output is to be increased to 2500 compared with 1000 during the past 12 months.

# Chalmers Financing Plans Ratified

## Cars To Be Continued—May Build 3-Ton Trucks if Maxwell Loses U. S. Order

NEW YORK, Sept. 10—Stockholders of the Chalmers Motor Corp. to-day ratified the refinancing plan recently announced and also the lease of the plant and assets of the company to the Maxwell Motor Co. for 5 years.

The Maxwell company, in taking over the Chalmers plant and organization, is to continue the manufacture of Chalmers cars, and in its surplus factory space is to build Chalmers 3-ton trucks for commercial work in case the Maxwell company fails to receive the Government contract for four-wheel-drive trucks which it expects.

Under the new financing plan the capitalization of the Chalmers company will consist of $3,150,000 in 6 per cent 5-year gold bonds secured by a first mortgage on its plant and assets, 44,000 shares of 8 per cent cumulative preferred stock of $100 par value and 400,000 shares of common stock of no par value. Of the $3,150,000 notes, $2,779,000 are to be offered to present stockholders, including syndicate stock, each stockholder paying an assessment of $10 a share on his present holdings; for example, the owner of 100 shares of the present stock pays $1,000, for which he receives $1,050 in gold bonds and he gives up twenty-five shares of his present stock, for which he is given sixteen and two-thirds shares of the new preferred, worth $1,666.67.

Changes in personnel and revision of policy in regard to marketing Chalmers products are to be taken up at a later meeting.

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### Moreland Plans Tractor Manufacture

BURBANK, CAL., Sept. 8—The Moreland Truck Co. is experimenting with two types of tractors which the company plans to manufacture on a large scale in the near future, and will commence production as soon as its $1,000,000 plant in this city is completed. One tractor will be of 30 hp. and the other of 75 hp.

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### Westcott Improves Body Lines

SPRINGFIELD, OHIO, Sept. 8—There are practically no mechanical changes in the new Westcott series 18, as compared with the series 17 cars. A few details have been altered, notably in the use of wick oil-cup lubrication instead of grease cups, and there is now a built-in tool compartment in place of the equipment formerly used. The body lines have been changed in accordance with the latest fashion in body work, and a storm-proof windshield, and a self-acting top added. The engine is a Continental, the gearset a Brown-Lipe, the axles are Timken and the steering gear Gemmer. It

has a unit power plant suspended at three points, with the drive taken through cantilever springs, and the rear axle torque absorbed by a torsion tube.

The engine is the standard 3½ in. by 5¼ in. six model 7N, having an S. A. E. rating of 29.4 and developing on the brake 50 hp. at 1900 r.p.m.

A single ignition system is employed, this and the generator, as well as the starting motor, being of Delco manufacture, with the grounded return system of wiring. The battery is a 120 amp. hr. Willard.

Wheels are 34 in. diameter and are equipped with 35 by 4½ in. oversize Firestone tires.

The equipment includes a Warner speedometer, five Firestone demountable rims, a four-bow automatic top, made by the Ashtabula Bow Socket Co., a Warner clock, Jiffy curtains with the Blackmore door feature, Stewart tire pump, and a Troy windshield. The car is made up in five body types. There is a seven-passenger touring, five-passenger touring, and a four-passenger roadster, each selling for $1,790. A convertible seven-passenger sedan sells for $390 extra, and a convertible five-passenger sedan for the same price. Any of these cars can be furnished in gray or blue. They are all mounted on a 125 in. wheelbase and upholstered in dull finish long grain leather in the case of the touring and roadster, and in a choice of cloth in the case of the convertible sedans.

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### Sperry to Speak to Detroit Section

DETROIT, Sept. 11—At the meeting of the Detroit Section of the Society of Automotive Engineers Sept. 14, R. H. Sperry of the General Motors Co., chairman of the chemical and metallurgical division of the industrial research committee of the Society of Automotive Engineers, will deliver a paper which has been prepared by himself and the committee which includes A. E. LeClerq of the Chalmers Motor Co., K. M. Wise of the Detroit Testing Laboratory, and F. E. McCleary of Dodge Brothers.

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### PRODUCTION

DETROIT, Sept. 11—The Chevrolet Motor Co. in the first 6 months of 1917 sold 65,235 cars compared with 32,514 cars in the first half of 1916.

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CINCINNATI, Sept. 8—Production and sales of the United States Motor Truck Co. during the past year increased 1000 per cent. The output for the coming year will be doubled. A building two stories high, 490 by 90 ft., will be used for the progressive assembly system which will replace the present method of group assembly. At this time the plant covers 353,000 sq. ft. of space.

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SYRACUSE, Sept. 8—The production schedule of the H. H. Franklin Mfg. Co. from Sept. 1 calls for the manufacture of 1000 Franklins a month, for 6 months, the total of 6000 cars comparing with 5000 produced during the past 6 months. All of the 6000 cars on the new 6 months' schedule have been contracted for.

# Mass. Registrations Increase

## Records Show 15,451 Cars Sold in State in July and August

BOSTON, Sept. 9—According to the figures of the Massachusetts Highway Commission the Bay State has shown one of the largest increases as far as the buying of automobiles is concerned by registering in July and August about seven times as many cars, a period of just 2 months, as the increase for the first half of 1917 showed over all of 1916. In other words, when the figures were compiled from January to June, inclusive, it showed there were 2262 more cars listed than there were all during 1916. In July and August there were added 15,451. During the first 6 months the trucks led the cars in the increase, but in the last 2 months the commercial vehicles were swamped.

Looking at the figures one finds that during the first 8 months of this year nearly as many passenger cars were registered as cars and trucks during the whole of 1916. For example, the cars listed to Sept. 1 were 136,238. The total number of vehicles registered for the entire year of 1916 were 136,809.

FIGURES SHOWING GAIN IN MOTOR VEHICLES IN MASSACHUSETTS IN PAST 2 MONTHS

| | Entire Year of 1916 | First 6 Mo. of 1917 | First 6 Mo. Increase |
|---|---|---|---|
| Cars | 117,615 | 120,877 | 2,262 |
| Trucks | 18,194 | 21,974 | 3,780 |
| Total vehicles | 136,809 | 142,851 | 6,042 |
| Motorcycles | 10,713 | 8,695 | *2,018 |
| Makers, dealers | 1,977 | 2,275 | 298 |

*Less.

| | First 8 Mo. 1917 | Gain Over Entire 1916 | Increase in Last 2 Mo. |
|---|---|---|---|
| Cars | 136,238 | 18,713 | 15,451 |
| Trucks | 24,025 | 5,831 | 2 051 |
| Total vehicles | 160,353 | 23,544 | 17,502 |
| Motorcycles | 11,239 | 526 | 2,544 |
| Makers, dealers | 2,355 | 378 | 60 |

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### 100 Per Cent Increase in Wisconsin License Fees

MILWAUKEE, WIS., Sept. 10—An increase of 100 per cent or more in the price of automobile registry in Wisconsin will become effective on Jan. 1, 1918, at which time private owners will be required to pay $10 for an annual license instead of $5, as during the last 8 years; dealers will pay $25 instead of $10 for an annual license, and motorcyclists will pay $4 instead of $2. The license system also has been changed so that motor trucks, formerly classed with the cars of private owners, will be required to pay a graduated scale of fees based on advertised load-carrying capacity.

Heretofore Wisconsin dealers were obliged to pay an annual fee of $10, and thus were entitled to four pairs of "star" number plates to distinguish dealers from private owners' cars. Under the new law, dealers will be required to pay $25 a year, but will receive eight pairs of license plates.

Fees for motor trucks are as follows: If the advertised load-carrying capacity is less than 2100 pounds, $15 per annum; if 2100 pounds or more and less than 5100 pounds, $20 per annum; if in excess of 5100 pounds, $25 per annum. It is provided, however, that if the owner of any motor truck, motor delivery wagon, or passenger motor bus, accompanies his application for registration with an affidavit that said vehicle will be used entirely for the transportation of persons or goods within the limits of an incorporated city or village, the fee shall be only $10 and the registration number plates shall be of the same number series and character as those furnished for ordinary cars belonging to private owners. The idea is to make the owners of trucks using the country highways of the state pay more than those whose cars are used entirely upon streets and roads maintained by cities and villages at their own expense.

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### Munger Sues Firestone for $1,500,000 on Back Royalty

NEW YORK, Sept. 8—Louis deF. Munger has brought suit against the Firestone Tire & Rubber Co. for back royalty amounting to $1,500,000, claiming damages through having been unable to dispose of his patents on account of the Firestone rim. The suit has been entered in the United States District Court and is the first to be brought as a result of the favorable decision against the Perlman Rim Corp. last June in Munger's claim of infringement on his patent No. 638,588 of Dec. 5, 1899, covering a tapered rim fitting into a tapered felly.

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### Gillette Stockholders Sue for Receiver

INDIANAPOLIS, Sept. 8—Stockholders of the Gillette Motor Co., Mishawaka, Ind., have filed suit seeking the appointment of a receiver for the company. The plaintiffs allege that the company has failed to fulfill its contracts, and that the manufacture of the Wilmo engine has not been carried out, as was originally intended. It is alleged furthermore that the company is insolvent; that it has failed to pay its obligations; that its assets are not sufficient to pay its debts, and that the funds of the company have been misappropriated. King C. Gillette, razor manufacturer, founded the company, which is incorporated under the laws of West Virginia.

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### Drexel Property To Be Auctioned

CHICAGO, Sept. 11—Referee in Bankruptcy Sidney C. Eastman has entered an order allowing Harry B. Staver, a trustee for the Drexel Motor Car Co., which went into bankruptcy several months ago, to sell at auction property valued at approximately $122,410. The auction will be held in the near future.

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### To Make Engines Under Field Patents

GRAND RAPIDS, MICH., Sept. 8—The Field Motor Co. has signed an agreement with the Chandler & Taylor Co. giving the privilege to manufacture engines under the Field patents on a large royalty basis.

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### Two New Howe Spotlights

CHICAGO, Sept. 12—The Howe Mfg. Co. has brought out two new Howe spotlight models at $5.50 and $4. The new No. 5 model follows the specifications of the model 9, being a double shell lamp and having a baked-on enamel finish, 4-in.

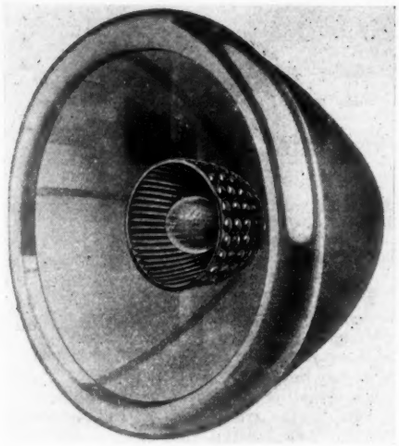
rear view mirror, and the on-and-off switch in the handle. The other new model, No. 15, is a single shell spotlight of strong construction, having a convex lens, 4-in. rear view mirror and the baked-on enamel finish. With these two models, as in the rest of the Howe lamps, clamps are furnished in seven styles to fit each and every windshield frame.

### Goodyear Adds Four Makers

AKRON, Sept. 10—The Goodyear Tire & Rubber Co. has retained for 1918 every manufacturer's contract of the year preceding, and has added Cadillac, Stearns, Winton and National to the list. The company states that 40 per cent of all cars manufactured in 1917 left the maker's factory with Goodyear tires for the original equipment.

### Hanes Rubber Now Producing

WINSTON-SALEM, N. C., Sept. 7—The Hanes Rubber Co., a concern organized 2 years ago, has completed its factory here and is now in production, the first tire having been turned out last month.



Stewart headlight lens

The Hanes is making plain tread, a "ground gripper," non-skid and red and gray tubes. A cord tire will be added to the line shortly. The establishment of a plant at Winston-Salem represents the first effort on a large scale to establish tire manufacturing in the South, which many regard as a favorable location because of the proximity to the cotton fabric district. The Hanes Rubber Co. has a capital stock of $500,000, which is held by two men, A. S. Hanes, for 11 years head of the Hanes Hosiery Mills, and John W. Hanes, formerly with the American Tobacco Co. and the De-Lion Tire Co., Trenton. Chris Miller, who has been with Dunlop, Michelin and Continental in Europe, is general factory manager.

### Stewart No-Glare Lens for $2

CHICAGO, Sept. 12 — The Stewart-Warner Speedometer Corp. has brought out a new headlight lens selling at $2 a pair. The device consists of a cup-shaped glass bowl which surrounds the light bulb. At the back it fits around the bulb stem. The forward end is open. The outer surface is covered with a series of curved elevations; the inner surface is ribbed.

## U. S. Aviation Engine Proves Success in Tests

(*Continued from page* 468)

tails of design and an order for several motors put through which were completed and the testing started before the end of July. These tests have now been so satisfactory that the Aircraft Production Board has permitted this statement to be made.

The development of these engines largely rested with two engineers, one connected with the automobile industry and the other with the aviation industry. The engine must not be looked upon as the conception of these two, but rather the work of a score of engineers under the direction of the two in question. When designing their engines there was no attempt at originality or invention, but solely an effort to combine the best aviation engineering practice as determined in the war zone during the last two and one-half years. The greatest assistance was given by English, French and Italian engineers, and members of commissions from those countries present in the United States during May and June. The U. S. Government assisted by supplying blueprints and photographs of the leading ally and enemy motors. These were obtained from captured machines. In addition parts of wrecked enemy machines as well as motors from all the European allies were furnished.

This work was greatly accelerated by engineers from many automobile concerns in America, as well as aviation concerns, who were invited to Washington and other points to confer on all questions of design. It is the highest credit to all companies that they immediately entered into the project with the greatest unanimity. Engineers of rival concerns met and gave their best to develop the U. S. engine. Rivalry was buried and all combined to give their best for the common cause.

After laying their plans before the Aircraft Production Board in Washington, they were requested to evolve a design that would admit of specially rapid production, and yet be an engine that would show up on even terms with the best European designs in regard to power and weight per horsepower.

The work immediately took on an international flavor as the best practice in foreign lands was closely studied, the Government supplying them with blueprints of the best machines in Europe and European engineers lending every assistance. France, England, Italy and the other Allies held nothing back and from captured enemy machines the latest practice in their work was studied. Everything that tended to hold back production was tabooed. No individual engineer was allowed to inject his own whims into the design. There was to be no experimentation, only an incorporation of what had been tried and found satisfactory in the war zone.

### Real Co-operation

Designing a standardized engine of this type greatly facilitates manufacture. No announcement of the plans for manufacture have been given out but undoubtedly the engine will be the U. S. aviation engine, no matter in what factory it is to be manufactured. The name of the factory in which it is to be manufactured will not in any way appear on the job any more than the name of a factory making ammunition would stamp its name on the shells made.

It should be possible to place orders for such a motor in several factories and have the work done under Government inspection with one efficient corps of inspectors supervising the entire job. It may be wondered why the U. S. Government did not decide to adopt one of the efficient European aviation motors now used in the war zone and manufacture it, such motors having been under manufacture in America for the Allies for many months and the manufacture still being continued. The adoption of such a motor as a standard for U. S. A. was difficult because the design of most of them is such as to call for a considerable amount of hand labor, and as such they did not lend themselves to production to the extent considered necessary by the Aircraft Production Board.

As little more than 30 days were needed to develop the U. S. aviation motor, it is much better to spend that brief time in developing a motor that can be manufactured in great quantities and which is designed with respect to American factories and American manufacturing methods.

The present U. S. aviation engine, which has given such satisfactory results in tests that have been going on for weeks does not represent the final word in American aviation engine design, but will be improved upon from week to week just as the engines of all the European warring nations are.

Each month sees a new engine come into the war spotlight and set a new pace. Engines that are leaders to-day may be trailers 10 months hence. Because of this, improvements may be looked for in the U. S. engine as developments at the front warrant, but these changes will not be permitted to interfere with quantity production. On the other hand, the construction of the U. S. engine will not in any way be permitted to handicap the manufacture of other models, either European or American which existing American plants are already prepared to manufacture.

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

NEW YORK, Sept. 12—That the administration is in favor of constructive action affecting business has been a bright spot in the activities of the various industries. Many instances are cited of liberal treatment of manufacturers on war orders. In such cases the Government has contracted to advance funds for new buildings to supply steel, to guarantee wages, all under an arrangement of a satisfactory maximum percentage of profit to the manufacturer. In the matter of price fixing the Government is also pursuing a reasonable course. In no case, unless it be that of soft coal, has there been any radical change from present prices. On the contrary, figures have been allowed which will grant producers liberal profits by preventing erratic and extreme speculative fluctuations, a degree of stability thus being introduced into industry which should prove satisfactory to all concerned. Interest in the steel trade again is centered upon the question of government price-fixing. The renewed interest is due to the expectation that the Government will make its decision known speedily. Prices fixed for coke to be used on government contracts were more or less disturbing to those who hoped that the Government would not take an extreme position on price.

### Allies Buying Their Own Steel

Readjustment in iron and steel values is slow-paced and the Government situation is more complicated if anything. A significant fact is that representatives of some of the Entente Allies are again actively negotiating on their own behalf, indicating the suspension, for the time at least, of efforts to get steel for them through the war industries board at the prices to be fixed later for the Washington Government.

The Attorney General has given an opinion that manufacturer members of advisory committees may continue their activities at Washington, by declaring their interest in each Government contract that may be taken by their companies. The steel committee has not resumed its functions, however, as the opinion is considered vague on some points and machinery is lacking for complying with the conditions imposed.

By the latest survey of Army and Navy needs, the mills will be called on to supply the Government for more shell steel than has been talked of, in the great prominence given to ship plates. It develops also that some large shipments on shell steel contracts are yet to be made to Great Britain and that that country will buy a considerable additional amount of such steel from the United States.

Large requirements of fabricated steel for American operations in France are indicated by the placing of 100 steel buildings this week with the Blaw Construction Co., Pittsburgh, calling for 11,000 tons. Thirty-two other buildings also for France are pending. There is in addition $5,000,000 worth of steel buildings for the new gun-making plants of private manufacturers in this country.

Italy is in the market for billets and various finished products and has offered $60 at mill for open-hearth steel. For eight vessels for Italy the American International Steel Corporation has asked for 15,200 tons of plates, 5600 tons of shapes and 800 tons of bars.

Recent Government purchases have included 4000 tons of rivets and some large bolt contracts are pending, one calling for 20,000,000 bolts. The Government has added 14,000 kegs of nails at $3.20 to its recent purchases, these being for aviation camps.—*Iron Age.*

### A New Service

*Herewith* THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial cooperation of leading industrial publications which are recognized authorities.*

*By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.*

### No Change in Rubber World

Aside from the movement of tire prices upward, there has been no change in the rubber world during the past week. Crude rubber prices remained firm despite the fact that business is quiet. The usual indications of fall activity in commercial lines are lacking. Although there is still a demand for rubberized fabric, yet the Government work is giving about all the work that the available spreaders can handle.—*India Rubber World.*

### Coal Interests Disturbed

Developments in the coke and coal field have aroused new speculations on the results. The price fixed on coke was $3 and $3.50 a ton against a market price of around $13. Some fear is expressed that the Government basis will be too low for comfort. A shortage of coking coal in district, attributed to the withdrawal of railroad cars by the Government, has caused the Carnegie Steel Co. to blow out seven furnaces and the Illinois Steel Co. three furnaces.

The production and distribution of anthracite is going on practically unaffected by the Government price-fixing policy. All-rail movement of this coal to New England is improving slightly. All of the larger anthracite companies have adjusted their schedule of prices to agree with those fixed by the Government.—*Coal Age.*

### Government Buys Overcoatings

Government purchases of overcoatings have been the chief events in the textile world during the past week. This activity means that the clothiers who usually stock up for a year ahead at this time will not be able to get either the usual variety or quantity of goods in comparison with normal seasons. There has been a slight improvement in the cotton goods situation due to a strengthening of the raw material market. The labor situation is acute in certain sections. It is between seasons for the woolen trade and there seems to be no haste in starting on new lines.—*Textile World Journal.*

### Garage Building Active in New York

The chief activity in the civil lines of the building trade in New York State during the past week is garage building. A noticeable stimulus along this line is to be felt in the Hudson River towns especially. There have been no big contracts let during the past week. The brick situation is bad, production costs are high, and demand low. Although the wholesale price has been depressed to $8 per 1000 there has been no appreciable increase in buying. The Government work uses lumber, steel, and re-inforced concrete, but very little concrete, and as civil work in the building trades is very dull the activity in the brick market is sub-normal.—*F. W. Dodge Construction Reports.*

### Electrical Convention Season Opening

Four conventions of interest to the electrical world opened this week and others are scheduled for the near future, signalling the opening of the regular fall and winter season. The brevity of these get-togethers is significant during the present season as all matters except necessary business are being dispensed with. As a rule these occasions present an opportunity for jollification; but the demands of the war are such that the minimum of time is being used.—*Electrical World.*

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### $300,000 Fire at Standard Steel Products Plant

DETROIT, Sept. 12—Fire caused $300,000 damage to the Standard Steel Products Co. factory to-day. The plant has been working on Government orders, manufacturing automatic screw machines. More than 100 complete machines ready for shipment were lost.

# Goodyear Aug. Sales $12,500,000

## Company Establishes New Sales Record—Aim for Year $100,000,000

AKRON, Sept. 8—The Goodyear Tire & Rubber Co. transacted business amounting to more than $12,577,000 during the month of August, the largest business ever done by the company in any one month. Officials of the company predict the year's business will be $100,000,000.

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### FINANCIAL

NEW YORK, Sept. 8—The Saxon Motor Car Corp. has issued its annual statement for the fiscal year ended June 30, 1917, showing a net income for the year of $663,768, compared with $1,316,273 for the preceding period. The report shows that net results of operations, after crediting use and occupancy insurance and charging all extraordinary operating expenses occasioned by fire, amounted to $763,768, from which was deducted $100,000 as reserve for contingencies, leaving the above net. This balance is equivalent to $11.06 a share earned on the $6,000,000 of capital stock. During the fiscal period the company paid a bonus amounting to $60,371 and dividends on the stock totaling $315,000. After these deductions there remained a balance of $288,397, which, added to $873,443, the surplus as at June 30, 1916, gives a profit and loss surplus amounting to $1,161,840.

The balance sheet as of June 30, 1917, is as follows:

**ASSETS**

| | 1917 | 1916 |
|---|---|---|
| Property account and equipment | $862,369 | $73,914 |
| Investment | 6,000 | 7,500 |
| Cash | 196,825 | 596,722 |
| Inventory | 4,593,664 | 2,134,327 |
| Deferred charges | 50,649 | 18,143 |
| Good will, etc. | 4,557,229 | 4,557,229 |
| Total | $12,339,361 | $7,780,665 |

**LIABILITIES**

| | | |
|---|---|---|
| Capital stock | $6,000,000 | $6,000,000 |
| Notes, etc. | 5,077,521 | 907,222 |
| Res. for contingencies | 100,000 | ..... |
| Surplus | 1,161,840 | 873,443 |
| Total | $12,339,361 | $7,780,665 |

The fire at the Saxon plant last winter produced a loss of $1,000,000 in inventories, and though covered by insurance, was the cause of a loss of time and sale of cars. The unusually large inventory displayed in the statement was caused by the fact that following the fire the materials continued to enter the plant, while the number of cars made and shipped diminished, until recently when the plant again entered into large production.

The annual stockholders' meeting will be held here Sept. 18.

—

DETROIT, Sept. 11—John Guy Monihan, president of the Harroun Motors Co., in his statement to the stockholders next week will say that the company is not only solvent but can liquidate at once and pay every cent invested.

A castings company was making castings for Harroun and held Harroun patterns. This company went bankrupt 60 days ago and the Harroun company, being unable to secure patterns, was unable to make deliveries. The Harroun company now has patterns and has turned them over to the Marshall Castings Co. and is receiving castings in fair quantities.

The company shipped eighteen cars last week and will ship over thirty this week. The statement shows the plant to be worth $1,200,000 with a capacity for eighty cars per day of a single shift and 150 per day with a double shift which can be increased by the additional buildings to 300 cars per day.

The company expects to turn out 24.000 cars the first year following a steadying of the materials markets and 50,000 the second year. Contracts from distributors total $15,000,000 for the first year, and the distributors' contracts range over 5-year periods with eighty-five chief distributors participating in the United States and Canada. The company has some materials on hand in quantities for 18,000 cars, but is short of sheet metal and castings, which delays production and delivery.

The president of the corporation drew no salary until recently, when the company commenced to make deliveries, and since then has drawn $2,000 to date.

The company has pending arrangements for raising $500,000 for additional working funds. The company's statement as of July 31, 1917, is as follows:

**Assets**

| | | |
|---|---|---|
| Property as per books: | | |
| Land and buildings | $184,076.14 | |
| Machinery and equip. | 294,965.61 | |
| Tools, dies, etc. | 165,855.55 | |
| Furniture, fixt'r's, etc. | 24,705.05 | |
| Construction of new building | 506,706.28 | |
| Cars and trucks belonging to company | 7,556.17 | |
| | | $1,183,864.80 |
| Patents, good-will and trade marks | | 6,391,745.50 |
| Treasury stock, par value | | 2,171,540.00 |
| Treasury stock in escrue, par value | | 500,000.00 |
| Current Assets: | | |
| Inventory | $289,844.74 | |
| Working process | 49,041.79 | |
| Cash on hand | 90,683.86 | |
| Accounts receivable | 1,756.16 | |
| Notes receivable | 100,125.00 | |
| Advances on contracts and acc'ts payable | 11,496.15 | |
| | | 542,947.70 |
| Prepaid insurance | | 9,183 23 |
| Advance to travelers | | 3,978.00 |
| Total | | $10,803,259.23 |

**Liabilities**

| | | |
|---|---|---|
| Capital Stock: | | |
| 1,000,000 shares at $10 par value authorized and issued | | $10,000,000.00 |
| Deferred Liabilities: | | |
| Stock subscriptions | $25,325.94 | |
| Stock subscriptions special | 100,000.00 | |
| Dealer deposits on cars | 86,232.49 | |
| Prouty & Glass land contract | 22,000.00 | |
| | | 243,558.43 |
| Current Liabilities: | | |
| Accounts payable | $361,548.80 | |
| Notes payable | 176,357.73 | |
| Accrued wages, salaries, etc. | 15,235.69 | |
| Unclaimed wages | 25.64 | |
| | | 553,167.86 |
| Surplus: | | |
| Income on sales | $564.17 | |
| Disc. on purchases | 1,332.99 | |
| Misc. incomes | 4,499.18 | |
| Interest earned | 136.70 | |
| | | $10,803,259.23 |

# Amston Takes Over Sterling

## $3,000,000 Company, Headed by C. M. Ams, To Build Cars and Trucks

NEW YORK, Sept. 11—The Amston Motor Car Corp., organized under the laws of Connecticut, with a capital stock of $3,000,000 of common of $10 par value, has purchased the principal assets of the Sterling Automobile Mfg. Co., Inc., of New York.

The new company will operate its own plant at Amston, Conn., and will primarily build a ½-ton light delivery wagon to be sold at from $900 to $950. The company will also build a roadster, five-passenger and several closed types of cars selling at $900 to $1,000.

Chas. M. Ams is president and general manager of the new company, and will have associated with him a number of prominent manufacturers and business men of Connecticut who will become members of the board of management. Mr. Ams is president of the Max Ams Machine Co., Bridgeport, Conn., manufacturer of can-making machinery and specializing in heavy presses for sheet metal work, particularly for automobile parts. He is also president of Max Ams, Inc., canners and food conservers, New York.

Temporary offices of the Amston Motor Car Corp. are 101 Park Avenue, room 1113.

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### Mexican Import Car Tax Revoked

MEXICO CITY, Sept. 8—Mexican automobile dealers have succeeded in inducing the Government of Mexico to revoke the import tax of 60 cents per kilo of 2.20 lb. on cars which was to have gone into effect July 1.

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### Ocean Freight Rates to Be Lowered

WASHINGTON, Sept. 8—The Shipping Board voted recently to establish a chartering commission which will pass upon all charters of vessels leaving the Atlantic ports. Later the plan may be extended to Pacific trade. Reduced freight rates are also under consideration, the new rates ranging from $8 to $13 a ton, the amount depending upon the vessel and its destination. The new rates will be a reduction of from 60 to 75 per cent.

—

### $597,898 Sales for United Motors Co.

GRAND RAPIDS, MICH., Sept. 12—The United Motors Co. is doing the largest business in its history, according to a letter to its stockholders. Earnings for the period ending July 31, showed sales, truck and tractor departments, amounting to $573,971.36; sales service department, $23,926.95; total gross sales, $597,898.31, and United Truck & Equipment Co., earnings available for dividends, $49,381.82. Dividends on 7 per cent preferred stock, paid and accrued to Aug.

31, 1917, amounted to $11,446.75, giving a net profit of $37,935.07.

The business of the United Motors Co. shows an increase of more than 100 per cent in trucks made and orders filled for the period from Dec. 1, 1916, to July 31, 1917, over a like period in the preceding year.

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### CAPITAL CHANGES

NEW YORK, Sept. 12—The stockholders of the Scripps-Booth Motor Corp. yesterday authorized an increase in the capital stock from 70,000 shares of no par value to 120,000 shares of no par value.

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EAU CLAIRE, WIS., Sept. 10—Gillette Rubber Co., which has been incorporated under the laws of Maine to take over the business of the Gillette Safety Tire Co., now preparing to begin operations in its new $150,000 tire and rubber plant at Eau Claire, has increased its capital stock from $1,000,000 to $2,500,000.

—

### DIVIDENDS DECLARED

Willys-Overland Co., quarterly of 1¾ per cent on preferred, payable Oct. 1 to stock of record Sept. 20.

Pierce-Arrow Motor Car Co., quarterly of 2 per cent on preferred, payable Oct. 1 to stock of record Sept. 14.

—

### Continental Passes Dividend Payment

DETROIT, Sept. 10—The Continental Motors Corp. has notified stockholders that it will not pay an expected dividend on the common stock this month, but will pay dividends aggregating 6 per cent during the fiscal year.

# Motor Securities Are Weak

## General Motor's Heavy Liquidation Causes 7-Point Break—Other Stocks Sympathetic

NEW YORK, Sept. 12—New low marks and heavy liquidation featured the downward movement of automobile and accessory issues during the past 7 days. United Motors established a new low of 19¼. Existing prices are in marked contrast with those of last year. The stock was originally offered to the public at $62 per share in May, 1916, after which it climbed to $94 within less than 3 weeks. Chevrolet went down to 69 on Monday. General Motors has been the leader, of late, in the downward movement, which is interpreted in the financial district as the work of raiders.

Yesterday other stocks declined in sympathy with General Motors, Maxwell common finishing at a net loss of 1⅜ and the first preferred 2 points lower. Chandler Motors declined 4 points.

—

### Doble-Detroit To Sell $2,500,000 Stock

DETROIT, Sept. 8—The Doble-Detroit Steam Car Co. has been granted permission to sell $2,500,000 stock by the Michigan Securities Commission providing the company pays the General Engineering Co. only 15 per cent in stock and escrows that stock until 6 per cent has been paid from earnings on all stocks issued. The payment to the General Engineering Co. is in return for a license to use the Doble steam patents, the Doble-Detroit company to pay the General Engineering Co. 10 per cent of its capitalization in cash and 10 per cent in stock. Before the new commission ruling was made the Doble-Detroit capitalization was for $10,000,000.

—

### 300 Overland Dealers End Retail Sales Congress in Chicago

CHICAGO, Sept. 8—After a turbulent night on Lake Michigan aboard the Ss. South American, 300 dealers and distributors for the Willys-Overland Co. disembarked here this morning, were piloted through the loop district headed by two bands, taken to the local salesrooms and service station, and met this noon at luncheon at the Hotel La Salle. This marked the finale of or rather was an epilogue to the retail sales congress which started last May and finished Aug. 22. During this period 47,242 cars were sold, their retail value being $39,650,725, and the contest among dealers and distributors was so arranged that everyone entered on an equal basis.

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### Republic Brass and Precision Die Merge

PONTIAC, MICH., Sept. 7—The Republic Brass & Bronze Co. has been merged with the Precision Die Casting Co., Syracuse, N. Y., and is now erecting additional buildings to care for increased business.

—

### Federal Truck Holds Convention

DETROIT, Sept. 8—The Federal Motor Truck Co. has held a convention for its district sales managers during the past week, and tendered a dinner last Wednesday evening, where addresses were made by the company officials.

## Automotive Securities Quotations on the New York Exchange

| | Bid | Asked | Net Ch'ge |
|---|---|---|---|
| *Ajax Rubber Co. | 60 | 62½ | +2 |
| *J. I. Case T. M. Co. pfd. | 75 | 83 | —4⅞ |
| Chalmers Motor Co. com. | 7 | 10 | .. |
| Chalmers Motor Co. pfd. | .. | .. | .. |
| *Chandler Motor Car Co. | 79½ | 80 | +1 |
| Chevrolet Motor Co. | 69 | 71 | —1 |
| Curtiss Aeroplane | 39¼ | 38½ | + ¼ |
| Fisher Body Corp. com. | 31 | 38 | +1 |
| Fisher Body Corp. pfd. | 86½ | 90 | .. |
| Fisk Rubber Co. com. | 65 | 70 | . |
| Fisk Rubber Co. 1st pfd. | 104 | 106 | .. |
| Fisk Rubber Co. 2nd pfd. | 92 | 95 | .. |
| Firestone Tire & Rubber Co. com. | 116 | 120 | —1 |
| Firestone Tire & Rubber Co. pfd. | 102½ | 104½ | + ½ |
| *General Motors Co. com. | 96¼ | 96¾ | +9½ |
| *General Motors Co. pfd. | 82 | 87 | — ⅜ |
| *B. F. Goodrich Co. com. | 46 | 47 | + ¼ |
| *B. F. Goodrich Co. pfd. | 101 | 106 | +1 |
| Goodyear Tire & Rubber Co. com. | 186 | 190 | .. |
| Goodyear Tire & Rubber Co. pfd. | 101 | 105 | —4 |
| Grant Motor Car Corp. | 3 | 5 | .. |
| Hendre Mfg. Co. | 20 | 30 | —5 |
| Hupp Motor Car Corp. com. | 2½ | 3½ | — ½ |
| Hupp Motor Car Corp. pfd. | 80 | 85 | .. |
| International Motor Co. com. | 13 | 15 | +4 |
| International Motor Co. 1st pfd. | 58 | 61 | +28 |
| International Motor Co. 2nd pfd. | .. | .. | .. |
| *Kelly-Springfield Tire Co. com. | 44 | 44½ | +1¼ |
| *Kelly-Springfield Tire Co. 1st pfd. | 87 | 95 | .. |
| *Lee Rubber & Tire Corp. | 18½ | 19½ | — ½ |
| *Maxwell Motor Co., Inc. com. | 31¼ | 32 | — ¼ |
| *Maxwell Motor Co., Inc. 1st pfd. | 66 | 67 | .. |
| *Maxwell Motor Co., Inc. 2nd pfd. | 18½ | 20 | — ½ |
| Miller Rubber Co. com. | 175 | 180 | .. |
| Miller Rubber Co. pfd. | 102 | 104 | .. |
| Packard Motor Car Co. com. | 145 | 152 | +8 |
| Packard Motor Car Co. pfd. | 96 | 99 | .. |
| Paige-Detroit Motor Car Co. | 24 | 26 | .. |
| Peerless Truck & Motor Corp. | 13 | 15 | .. |
| Portage Rubber Co. com. | 140 | 145 | .. |
| Portage Rubber Co. pfd. | .. | .. | .. |
| Regal Motor Car Co. pfd. | 15 | 20 | .. |
| Reo Motor Car Co. | 26 | 27 | +1 |
| *Saxon Motor Car Corp. | 13 | 14½ | .. |
| Springfield Body Corp. com. | 1 | 6 | —1 |
| Springfield Body Corp. pfd. | 8 | 18 | —2 |
| Standard Motor Construction Co. | 8¾ | 9 | .. |
| *Stewart-Warner Speed. Corp. | 57½ | 58½ | —4½ |
| *Studebaker Corp. com. | 43¾ | 44 | + ⅞ |
| *Studebaker Corp. pfd. | .. | 96 | .. |
| Submarine Boat | 25 | 21 | .. |
| Swinehart Tire & Rubber Co. | .. | 60 | .. |
| United Motors Corp. | 19¼ | 19½ | —1 |
| *U. S. Rubber Co. com. | 60¾ | 61 | +1 |
| *U. S. Rubber Co. pfd. | 105 | 106 | + ¼ |
| *White Motor Co. | 45 | 46 | +1½ |
| *Willys-Overland Co. com. | 27½ | 27¾ | — ¼ |
| *Willys-Overland Co. pfd. | 88 | 92 | —5 |
| Wright-Martin | 8⅝ | 8 | + ½ |

*At close September 10, 1917. Listed New York Stock Exchange.

### OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

| | Bid | Asked | Net Ch'ge |
|---|---|---|---|
| Auto Body Co. | 11¼ | .. | .. |
| Bower Roller Bearing Co. | 29 | .. | +3 |
| Chevrolet Motor Co. | 68 | 72 | —17 |
| Commerce Motor Car Co. | .. | .. | .. |
| Continental Motor Co. com. | 4⅞ | 5⅛ | —1⅛ |
| Continental Motor Co. pfd. | .. | .. | .. |
| Edmunds & Jones com. | .. | .. | .. |
| Ford Motor Co. of Canada | .. | 235 | .. |
| Hall Lamp Co. | .. | .. | .. |
| Michigan Stamping Co. com. | 13 | .. | .. |
| Motor Products | .. | .. | .. |
| Packard Motor Car Co. com. | .. | 149½ | .. |
| Packard Motor Car pfd. | .. | 98 | .. |
| Paige-Detroit Motor Car Co. | 24 | 26 | + ½ |
| Prudden Wheel Co. | .. | 20½ | .. |
| Reo Motor Car Co. | 26 | 26⅞ | +2 |

INACTIVE STOCKS

| | | | |
|---|---|---|---|
| Atlas Drop Forge | .. | 39 | .. |
| Kelsey Wheel Co. | 82 | .. | .. |
| Regal Motor Car Co. | .. | 26½ | .. |

# New Companies

WILMINGTON, DEL., Sept. 10—The Tenailer Truck Co. has been incorporated under the laws of Delaware, with a capital of $1,000,000, to build and deal in attachments for automobiles and motor trucks. The incorporators are W. S. Randall, F. A. Armstrong and Clement M. Egner, all of Wilmington.

—

EAU CLAIRE, WIS., Sept. 10—The New Way Machinery Co., Eau Claire, Wis., which has recently been incorporated with $60,000 capital, succeeds to the business of Wege Bros., formerly of Minneapolis, Minn., and manufacturing farm and general utility tractors, concrete mixers and other tools. A plant is now in operation in Eau Claire. The officers are: President, E. Wege; vice-president, J. Heintz; secretary and treasurer, Grant Haas.

—

BUFFALO, Sept. 8—The Transcontinental Motor Truck Corp. has been incorporated with a capital stock of $1,250,000 by E. S. Stengel, R. A. Schmidt and P. J. Bloxham to manufacture trucks, engines, motor boats, etc.

—

PITTSBURGH, Sept. 8—The Wangler Co. has entered the commercial body manufacturing field, after having engaged in the manufacture of tops, seat covers and sheet metal work for several years.

—

NEW YORK, Sept. 7—The Charles T. Gullett Motors Corp. has been formed to sell automobiles, motorcycles and accessories, with a capitalization of $50,000. The incorporators are Charles T. Gullett, Eleanor T. Gullett and Louis H. Siebel.

—

ALBANY, N. Y., Sept. 8—The Angola Tire & Rubber Co. of Buffalo has filed articles of incorporation. The capital is $1,000,000. F. M. Wood is one of the directors.

—

TOLEDO, Sept. 7—The American Magneto Co. has been incorporated with a capital stock of $400,000 to manufacture magnetos. The incorporators are W. C. Carr, V. E. Russell, Irving E. Macomber, A. A. Meggett and W. C. Abbott.

—

LANSING, MICH., Sept. 8—The J. P. Marting Mfg. Co. has been incorporated with $50,000 capital to manufacture anti-skid tires. Incorporators are J. P. Marting, G. A. Wright and F. E. Hood.

—

SALT LAKE CITY, UTAH, Sept. 7—The Wilson Motor Co. will build cars and trucks in this city in the near future. This new company is the combination of the Wilson Brothers' Garage and Machine Works and the Areo Water Supply Co., both of Paxico, Kan., and backed by Utah capital.

George S. Wilson, senior member of the firm of the first company, is president of the new company. J. P. Sprunt, of this city, is vice-president, and Walter Daniels, also of Salt Lake City, is secretary. The company is capitalized at $300,000.

Plans are under way for moving the plants from Paxico to this city. The company is arranging for a permanent factory, and plans to devote its activities not only to cars and trucks, but also to trailers, tractors, engines for farming, and to water supply systems.

—

COLUMBUS, Sept. 8—The Columbus Steel Products Co. has been incorporated with a capital of $50,000. Incorporators include S. A. Webb, M. A. Corbett, Harry B. Redding, F. E. Sanborn and H. C. Creith.

—

QUINCY, ILL., Sept. 7—The Stone Tractor Mfg. Co., which has a capital stock of $100,000, has opened offices at Texarkana preparatory to starting construction work on its proposed plant for the manufacture of tractor and farm machinery.

—

INDIANAPOLIS, IND., Sept. 8—Incorporation papers have been filed for the Roof Motor Specialty Co., Anderson. The company has a capitalization of $50,000, and will manufacture motor and automobile specialties. The incorporators are Robert M. Roof, James A. McMyler and William N. Durbin.

—

NEW YORK, Sept. 8—The Auto Pedal Pump Sales Corp. has been incorporated with a capital of $100,000 to manufacture motor trucks and accessories. The incorporators are: C. L. Beck, K. C. Busch, and A. R. Redburn.

—

MILWAUKEE, WIS., Sept. 7—The Wisconsin Gear & Axle Co. has been incorporated with a capital stock of $100,000 by Herman W. Noll, Jacob Scharmer and Bernard A. Hoermann. The company will engage in the manufacture of gears, transmissions, rear axles and other parts for passenger and commercial cars, tractors, and other machinery.

—

CHICAGO, ILL., Sept. 8—The Lee Gas Generator Co. has been formed with a capitalization of $50,000 to manufacture and deal in automobiles.

—

INDIANAPOLIS, Sept. 8—The C. C. Madison Mfg. Co. has been formed with $50,000 capital to manufacture attachments for traction wheels and other devices. The directors are M. O. Madison and G. L. Madison, both of Scandia, Kan.

—

CANTON, OHIO, Sept. 7—The Benoist Aeroplane Co. has been incorporated with a capital of $250,000 to manufacture airplanes and other aeronautical equipment. It is planned to erect a large plant at Canton. The incorporators are Charles A. Mullally, V. L. Ney, Edward L. Smith, J. A. Bernower and Charles E. Benoist.

—

WILMINGTON, DEL., Sept. 8—The Imperial Auto Wheel Co. has been incorporated here with a capitalization of $500,000 to manufacture and deal in automobiles and bicycles.

—

GRAND RAPIDS, MICH., Sept. 8—The Grand Rapids Auto Products Co. has been incorporated with a capital of $10,000. Incorporators include H. C. Bennet, R. J. White, C. M. McCarthy and Arthur Post.

—

CLEVELAND, Sept. 7—The Truck Engineering Co. has been formed here and consolidates the Olstyn Carriage Co. and the Central Wagon & Auto Co. Officers and directors include A. V. Cannon, F. M. Greeg, H. G. Hascall and M. T. Gardner.

—

JANESVILLE, WIS., Sept. 7—The tractor, farm machinery and implement manufacturing business conducted at Janesville, Wis., for the past year or more by Townsend Brothers has been incorporated with a capital stock of $125,000 under the name of Townsend Mfg. Co. The chief stockholders are R. C. Townsend, G. E. Townsend and R. B. Townsend.

—

WILMINGTON, DEL., Sept. 8—The Line Drive Truck & Tractor Corporation of Portland, Me., has been incorporated under the laws of Delaware, with a capital of $4,000,000; also the Motor Specialties Corp., Chicago, with a capital of $150,000.

—

GRAND RAPIDS, MICH., Sept. 11—The Monarch Storage Battery Co., which has been incorporated and organized in this city, as was told in a previous issue of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES, has started production and will manufacture batteries for several

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### Ford Sales Policy Changing

PETOSKEY, MICH., Sept. 10—Under a new arrangement with the Ford Motor Co. the Northern Auto Co., of this city, which for several years has had the agency for the Ford for Charlevoix, Emmet and Cheboygan, has withdrawn all former sub-agencies and formed a partnership by which several branches will be operated in the territory, each branch to have under its direct supervision the sales of all Ford products, including the passenger cars, trucks and tractors.

—

### United Motors Service Frisco Branch

DETROIT, Sept. 12—The United Motor Service, sole and official representative of the Delco, Klaxon and Remy companies has opened a large San Francisco branch in charge of H. J. Galvin, former San Francisco manager for Remy.

# Personals

**Charles Gould**, sales manager for the Maxwell Motor Co., Detroit, has resigned to take up goverment war work.

—

**Harry L. Shepler** has been appointed major in the airplane division. Mr. Shepler resigned last July as vice-president of the Willys-Overland Co., Toledo.

—

**Hoover Holton**, zone manager for the Maxwell Motor Co., Detroit, has resigned to become district sales manager for the White Co., Cleveland.

—

**R. R. Potter** has been appointed engineer of production, a new position created by Fuller & Sons Mfg. Co., Kalamazoo, Mich. Wm. Mitchell will have charge of production.

—

**J. C. Austin**, for 2 years assistant chief engineer of the Studebaker Corp., and for several years connected with other automobile companies, is now handling the Michigan, Ohio and northern Indiana business of the Tubular Rivet & Stud Co., Boston. His headquarters are at Detroit.

—

**R. S. McLaughlin**, president of the McLaughlin Motor Car Co., Oshawa, Ont., has been appointed a director of the Dominion Bank. He is also associated as official and director with the McLaughlin Carriage Co., J. J. McLaughlin Limited and the Chevrolet Motor Co. of Canada. Mr. McLaughlin entered the business of his father in 1887 and occupied various positions with the firm until he was named a director in 1900 and president in 1908. He is a member of the Manufacturers' Association and of the Canadian National Exhibition Committee.

—

**W. Owen Thomas**, of Thomas & Thomas, consulting automotive engineers of Detroit, was called to Chicago Sept. 7 for consulting work by Charles S. Rieman, vice-president and general manager of the Elgin Motor Car Corp.

—

**B. M. Kent**, of Washington, D. C., has been appointed patent counsel to the Wire Wheel Corp. of America. The concern has just established a patent department in its general office in Buffalo, N. Y.

—

**E. W. Goodwin** has become engineer of the body division of the Cadillac Motor Car Co., Detroit. Mr. Goodwin was in charge of the body division of the Chalmers Motor Co. for 1½ years, and has designed and superintended work for the Rothschilds American branch, the Holbrook Co., A. T. Demarest, Moore & Munger, G. W. Cole and others.

—

**R. W. Fontaine**, formerly special foreign representative of the Willys-Overland Co., Toledo, and who formed some time ago the Cuban Auto Importing Co., Havana, to sell Stutz and Cole cars, has resigned to take charge of the department of sales of the Havana Auto Co., representing the Renault, Pierce-Arrow, Mercer, Premier, Hupmobile and Anderson.

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**Frank A. Kapp** has become the new advertising manager of the Mitchell Motors Co., Racine, Wis. He was formerly a member of the advertising staff of the Willys-Overland Co.

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**Milo D. Herron** has been made sales manager of the Dart Motor Truck Co., Waterloo, Iowa. Mr. Herron was formerly sales manager and secretary of the Thomas Auto Truck Co.

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**A. S. Bowser**, who has been district sales manager of the S. F. Bowser Co., Fort Wayne, Ind., for Michigan, will resume his regular duties as secretary of the company. T. D. Kingsley, Chicago district manager, will assume the direction of the central sales division at Fort Wayne. R. R. Safford, assistant manager at Chicago, will become manager of the Minneapolis district. J. J. Burrows, manager of Indiana, becomes the Chicago district manager. A. W. Dorsch, Washington district manager, becomes manager at Fort Wayne.

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**Herbert A. Minturn**, engineer and factory manager of the Sun Motor Car Co., Elkhart, Ind., has resigned to accept a position as engineer for the Pilot Motor Car Co., Richmond, Ind. Mr. Minturn joined the Sun company at the time of its organization in Buffalo, N. Y.

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**C. B. Wisenburgh** has been appointed Western sales manager of the Standard Roller Bearing Co., Philadelphia, with headquarters at Detroit, succeeding A. N. Goodfellow, who recently resigned. Philip E. Jackson, representing the same company as sales engineer in the West for Mayo radiators, has joined the Second Officers Training Camp at Fort Sheridan, Ill., and his successor is not yet appointed.

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**Ford W. Gargett**, assistant sales manager of the Republic Truck Co., Alma, Mich., has been promoted to the position of export sales manager and advertising manager.

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**A. M. Armstrong**, formerly production manager of the American Locomotive Co. when this firm built motor trucks and cars, and more recently production manager of the Wright-Martin Aircraft Corp. and the Simplex Automobile Co., has been placed in complete charge of production of the Fulton Motor Truck Co., Farmingdale, L. I.

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**F. H. Brand**, at one time auditor of the Diamond Rubber Co., but for the past 4 years auditor of the Simplex Automobile Co., has taken up his duties as auditor and efficiency expert with the Fulton Motor Truck Co., Farmingdale, L. I.

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**E. K. McBride** has been appointed sales manager of the American Motor Truck Co., Detroit. Mr. McBride has been the assistant sales manager of the American Motor Truck Co. for several years.

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**E. W. Winan** has been appointed service manager of the Federal Motor Truck Co., Detroit.

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**W. W. Burke**, formerly Eastern sales manager for Gray & Davis, has been appointed sales manager of the Electrical Starter Division of the American Ever Ready Works, Long Island City, N. Y., and will have charge of the marketing of its new starting and lighting system for Ford cars.

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**Irving V. Thomas**, formerly factory manager of the old Lozier Motor Co., Detroit, now is production manager for the Hercules Motor Mfg. Co., Canton, Ohio.

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**Guy Hamilton**, vice-president of the Hamilton Motors Co., Grand Haven, Mich., maker of Panhard trucks, has resigned. His successor has not been named.

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**C. B. Wisenburgh** has been appointed western sales manager for the Standard Roller Bearing Co., Cleveland. Mr. Wisenburgh was formerly with the Vim Motor Truck Co., Philadelphia, Pa.

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**A. N. Goodfellow**, who was western sales manager for the Standard Roller Bearing Co., Cleveland, has joined the Nice Ball Bearing Co. of Philadelphia.

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**W. I. Brown** has been appointed assistant sales manager of the Elgin Motor Car Corp., Chicago. Mr. Brown was formerly sales manager of the Scripps-Booth Corp.

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**Ralph W. Davis** has been made a member of the engineering department of the Mitchell Motor Car Co., Racine, Wis. Mr. Davis was formerly in the engineering department of the Cadillac Motor Car Co. as chief draughtsman.

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**G. E. Strohm** has succeeded T. A. Flaherty as manager of the Detroit branch of the Prest-O-Lite Co. Mr. Flaherty has joined the officers' reserve training camp.

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## ELECTIONS

DETROIT, Sept. 8—Following the retirement of Charles M. Hall from the Wetzel-Hall Co., as told in a recent issue of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES, Thomas J. Wetzel was elected president, Don M. Coffman vice-president and A. M. Gent secretary and treasurer.

# Factory

**Hyatt Roller Bearing Co.**, Harrison, N. J., has acquired a foundry building, about 100 by 175 ft., on Somerset Street, formerly occupied by Reuther Bros., iron founders. It will be used as a works extension.

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**Burlington Motor Truck Co.**, Burlington, Wis., organized recently with a capital of $50,000, has leased manufacturing quarters and will build 600 commercial car units for attachment to Ford chassis by Jan. 1, 1918. The design employs the Torbensen internal gear drive axle. A Chicago office has been opened at 160 West Jackson Boulevard.

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**Jorgenson Mfg. Co.**, incorporated at Waupaca, Wis., with a capital of $75,000, succeeds the Jorgenson Machine Co., Tustin, Wis., which has moved its plant to Waupaca and will henceforth devote most of its attention to the production of automobile accessories, including a primer, a carbureter, kerosene vaporizing devices, etc. The company will occupy the former plant of the Waupaca Felting Mills, served by power dam and hydro-electric generator. P. J. Jorgenson is president and general manager.

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**International Harvester Co. of America** has awarded contracts for construction of a large core building, 100 by 240 ft., costing $100,000, in connection with its big foundry at the Milwaukee Harvester Works, 784 Park Street, Milwaukee.

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**Mitchell Motors Co.**, Racine, Wis., held a picnic for its employees Sept. 8, at which games were played, etc.

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**Vesta Accumulator Co.**, Chicago, has published its first issue of the Vesta Twelve-Eighty, to be issued monthly for the promotion of efficiency of its service stations, which number more than 700.

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**Jenkins Vulcan Spring Co.**, St. Louis, Mo., will move its plant to Richmond, Ind., where a new plant is being built for the company. The Richmond Commercial Club subscribed for $100,000 worth of stock in the company, this being a provision attached to the change of locations. The company will manufacture springs for automobiles.

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**Master Trucks, Inc.**, Chicago, maker of the Master 2-ton truck, has sold $890,000 worth of trucks to the M. C. W. Motor Sales Corp., New York. The company has been turning out trucks for 4 months.

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**Globe Seamless Steel Tubes Co.**, Milwaukee, has broken ground for a brick and steel shop addition, 500 by 50 ft., which will make possible the enlargement of capacity by about 50 per cent. The company manufactures a variety of steel tubing for the automobile industry, including drive shafts, steering columns, etc.

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**Lang Body Co.**, Cleveland, will erect a new building for manufacturing purposes at a cost of $75,000.

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**Oneida Motor Truck Co.**, Green Bay, Wis., capital stock $300,000, is awarding contracts for the erection of the first unit of its new truck plant, to be 130 by 475 ft. in size, fireproof, with separate power plant and office buildings. It will be ready about Dec. 1 or 15. In the meantime the company will continue to produce trucks in leased quarters taken about 6 months ago.

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**Townsend Mfg. Co.**, Janesville, Wis., which incorporated its engine, tractor and agricultural machinery business with a capital stock of $125,000, as noted, is planning to treble its output by the erection of a machine shop addition, 75 by 200 ft. in size. The business was established less than 3 years ago. Practically all of its trade has been on Canadian account, but contracts are being made for 300 tractors for the United States. An order for 100 engines and fifty complete tractors for the Canadian Fairbanks-Morse Co. is now being completed. The Townsend company will concentrate upon a 12-25 type of general purpose tractor, operating on kerosene or distillate. The machine is built so that the engine forms a complete unit for farm work and the tractor chassis another unit. Numerous buyers of the engine later buy chassis. The output for the coming year is planned to be 600 tractors and 200 engine units.

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**Saginaw Auto Body Co.**, Saginaw, Mich., has started production operations with a capacity of eighty bodies a day, half of that number being built on a contract for one automobile maker.

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**Gray Motor Co.**, Detroit, is building a new and larger plant for the manufacture of its product. The plans call for three separate buildings, including a machine shop, mill building and heat treating plant.

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**Hessian Tiller & Tractor Co.**, Wayne, Mich., plans to erect a large plant in this city for the manufacture of its new tractors.

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**Racine Motor Truck Co.**, Racine, Wis., which has been manufacturing Reliance motor trucks in leased quarters, is reported to be contemplating a new location in Milwaukee. As already reported, the company is making preliminary arrangements for building and equipping a plant of its own, in which it will manufacture Piggins internal spur gear axles in addition to trucks designed by the Piggins brothers of Racine. Several factory sites in Milwaukee are under consideration. The company is capitalized at $500,000.

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**Berry Bros.**, Detroit, paint and varnish manufacturers, have secured large contracts from the allied governments for a varnish to be used on the airplanes made by those countries.

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**Gas Motor Efficiency Co.**, Janesville, Wis., maker of spark plugs, will double its capacity to provide for a production of 1200 plugs a day.

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**Hoosier Iron Co.**, Kokomo, Ind., is building an addition to its plant in which to manufacture tractor transmissions. By Oct. 1 the company expects to be producing 50 tons of transmissions daily.

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**Auto Radiator Co.**, Philadelphia, is taking bids for the construction of a new two-story plant, about 30 by 80 ft.

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**Landover Truck Co.**, Menominee, Mich., will use the Iron Works factory for 1 year.

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**La Crosse Tractor Co.**, La Crosse, Wis., has supplemented its recent offer to the factory employees of a bonus of 10 per cent of their wages from July 1 to Nov. 1 provided they stay with the company throughout the season, with an added bonus amounting to 8 to 10 per cent of their wages for the coming 3 months. This is contingent on the amount of tractors produced up to Nov. 1.

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### Haynes Interested in Camping Car

MADISON, WIS., Sept. 8—It is reported on excellent authority that interests represented by Elwood Haynes, of the Haynes Automobile Co., Kokomo, Ind., and Winthrop Burdick and C. E. Schinberg, Chicago, are negotiating for the establishment of a plant in Madison, Wis., for the manufacture of a passenger car equipped for quick transformation into a camping outfit. It is said that the Government already has agreed to purchase 500 to 750 of the cars. Further details are not available at this time

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### New Appleton Stationary Engine

APPLETON, WIS., Sept. 10—A new type of stationary and portable gas engine for farm and general utility purposes is now being produced in quantities by the Appleton Engine Works. The engine is a self-contained unit, completely inclosed, and there are no levers or wheels or other dangerous external parts. It

is equipped with a magneto and one of the most compact engines of this type ever built.

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### Prismolite Merges Benwill

COLUMBUS, OHIO, Sept. 10—The Prismolite Co., maker of lenses for automobile headlights, has taken over the plant and business of the Benwill Manufacturing Co., Columbus, maker of automobile accessories. The latter concern has been specializing in shirling flags.

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### Mexican Government Backs Automobile Maker

WASHINGTON, Sept. 8—The Mexican Government is standing sponsor for a company which has been organized at Monterey, capital of Neuva Leon, for the manufacture of automobiles. It is officially announced that it is believed the effort will prove successful.

The Carranza Government is giving much attention to the introduction of the automobile into the various activities of the government, and airplane mail routes also have been established. The good roads question is being given special attention, and automobile travel is now possible in sections of the country where it was impossible for cars to go before.

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### 6784 Fords in Quebec

MONTREAL, QUE., Sept. 8.—The following statistics show the number of licenses issued from April 1st, 1916, to March 1, 1917, to seventeen respective makes of cars:

| | | | |
|---|---|---|---|
| Fords | 6784 | Reo | 284 |
| McLaughlins | 1256 | Russell | 192 |
| Studebakers | 1077 | Packard | 173 |
| Overlands | 977 | Chalmers | 123 |
| Chevrolet | 768 | Pierce Arrow | 101 |
| Maxwell | 442 | Gray Dort | 78 |
| Cadillac | 407 | Cole | 66 |
| Hudson | 291 | Jackson | 65 |

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### Bowser Pays Apprentices for Their Schooling

FORT WAYNE, IND., Sept. 10—S. F. Bowser & Co. have installed a school for apprentices which allows those apprentices now at work in the shop to study and work and receive payment for their time. The course is as follows:

**First Year**

Period, First Quarter—Rate, 14½; department, tool room; duties, errand boy.
Second Quarter—14½; tool crib; learn names of tools; grind tools.
Third Quarter—16; A, small screw machine and turret lathe.
Fourth Quarter—16; tool room; small engine lathe work; odd jobs.

**Second Year**

First Quarter—17; B, engine lathe and turret lathe work.
Second Quarter—17; B, milling machine work.
Third Quarter—21½; A, assemble and fill-in on idle machines.
Fourth Quarter—21½; A, assemble; learn Bowser outfits.

**Third Year**

First Quarter—23; A, productive work on engine lathe.
Second Quarter—23; B, better class of machine work.
Third Quarter—25½; tool room; learn better class of machine work.
Fourth Quarter—25½; tool room; make patterns and models.

**Fourth Year**

First Quarter—28; tool room; repairing machines and tools.
Second Quarter—28; B, learn boring mill work.
Third Quarter—31½; B, learn bench assembling, planer and shaper machines.
Fourth Quarter—31½; assistant foreman in some section.

# Calendar

**ASSOCIATIONS**

Oct. 9-11—Pittsburgh National Assn. of Purchasing Agts., Convention.
Oct. 9-11. — Chicago, National Federation of Implement and Vehicle Dealers' Assn., 18th Annual Convention, Hotel Sherman.

**CONTESTS**

Sept. 15 — Providence, R. I., Speedway Race.
Sept. 22—Allentown, Pa., Track Race.
Sept. 22—New York Speedway Race.
Sept. 28—Trenton, N. J., Track Race.
Oct. 6—Danbury, Conn., Track Race.
Oct. 6—Uniontown, Pa., Speedway Race.
Oct. 13—Richmond, Va., Track Race.
Oct. 13 — Chicago Speedway Race.
Oct. 27—New York Speedway Race.
Oct. 24—Columbus, Ohio, Dixie Highway Tour.

**SHOWS**

Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.
Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin.
Sept. 17-24 — Grand Rapids, Show, Automobile Business Assn.
State Fair, West Allis, Milwaukee Automobile Dealers.
Sept. 18-21 — Toronto, Annual Tractor Show, Canadian National Exhibition.
Sept. 18-22—Los Angeles, Cal., Second Annual Tractor Demonstration, Tractor Engine and Implement Dealers' Assn. of Southern California.
Sept. 18-22—Reading, Pa., Automobile Show at Fair, Reading Automobile Dealers' Assn.
Oct. 1-6—Buffalo, N. Y., Closed Car Show, Automobile Dealers' Assn., Elmwood Music Hall.
Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn., State Fair.
Oct. 6-13—Cincinnati Automobile Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Nov. 12-18—Denver, Colo., Show, Auditorium, Automobile Trades Assn. of Colorado.

**1918**

Jan. 5-12—New York Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 19-26—New York, Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.
Jan. 19-26—Montreal, Show, National Motor Show of Eastern Canada, Montreal Automobile Trade Assn.
Jan. 26-Feb. 2—Chicago National Show, Coliseum and Armory. National Automobile Chamber of Commerce.

# Engineering

American Railway Master Mechanics' Assn.
America nInstitute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automotive Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architecture and Marine Engineers.

**SEPTEMBER**

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
20—Mining & Met. Soc. of Amer. monthly meeting N. Y. section at Engrs. Club.
24—Amer. Inst. Metals at Boston.
24—Amer. Fdry. Assn. annual meeting at Boston.

**OCTOBER**

6—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
17-18-19—Amer. Gas. Inst. at Washington, D. C.
18—Mining & Met. Soc. Amer. monthly meeting New York section Engrs. Club.
20—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

**NOVEMBER**

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
15—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.
15-16—Soc. Naval Arch. & Marine Engrs. annual meeting.
17—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
19—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

**DECEMBER**

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
20—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.

# Tractor Displaces Horse for Hauling Heavy Artillery

(*Continued from page* 446)

dents, when a car or truck falls into a ditch or deep hole. A touring car completely overturned in the ditch can be lifted right out and placed on the road in a few minutes. An empty 3½-ton truck can be treated in the same way, while if loaded the cargo can first be removed and then the truck lifted out. In actual practice, however, this crane is most commonly employed at railroad depots. Frequently there are no platforms, the freight depot merely consisting of rails laid in a more or less open field. In these cases the Aratrice can unload from the railroad trucks to the ground or direct from a truck to its own trailers. With a skilled driver in charge, the Aratrice will head up to a railroad truck, pick up a load by means of its crane, back away, swing round to the trailer, back out, and again head up to the railroad truck, doing the work in considerably less time than is possible by hand labor.

**Hauling 12-In. Guns**

Another valuable field of usefulness is helping to get guns into suitable positions free from enemy observation. These positions are the most eccentric imaginable—a deep gully, a clearing in a thick wood, the base of some precipice—all of them positions into which a gun can only be dropped with the greatest difficulty without the aid of a crane. It is common practice for these tractors to haul and place into position guns as big as 12 in. In 1½ hours one tractor is capable of placing in position an 11-in. gun which could only be placed by an experienced artillery crew aided by horses after a day's hard labor.

On the higher peaks of the Italian Alps very little use can be made of infantry, but a very important rôle is played by artillery. The Italian military authorities have long realized that the only means of providing rapid and reliable transport for such heavy guns as the 8.6, the 11-in. and the 12-in. is by means of gasoline tractors of the Aratrice and Fiat types. In this sphere of military operations the horse is an ignored factor.

**Trailers for Ammunition**

Big guns being moved by means of tractors, it almost follows that ammunition should be taken to them in the same way. For this purpose trailers are employed, one of the most popular types being a Pavesi & Tolotti invention of a four-wheeler capable of being hauled from either end. The wheels are a special thick-wire spoke type attached to a rim which may be described as roughly resembling a rim for pneumatic tires. The edges in contact with the road surface are solid, and not hollow.

A rather important service performed by the Aratrice tractor is the clearing of snow off Alpine passes. Three special plows are fitted, one in front of the steering wheels and two diagonally between the steering and the driving wheels. It is found that with this powerful plow it is possible to keep roads open which otherwise would be snowed up and closed to all but sleigh traffic.

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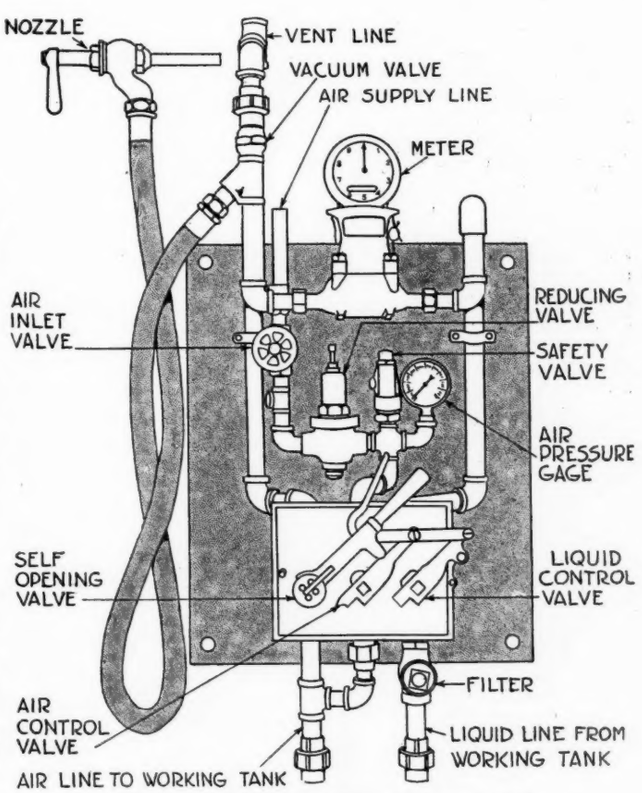
# The Apsco Pressure System

## Designed for Distributing Gasoline but May Be Used for Transferring Oils and Other Liquids from Underground Tanks To Other Containers

A SYSTEM by which gasoline, lubricating oil, varnish, etc., may be stored in underground tanks and raised to any floor of a building has been developed by the Allen Pressure System Co., Inc., of New York. It comprises essentially three parts, viz.: A storage tank, a working tank and a drawoff panel. Only the working tank is subjected to pressure. The fluid stored and transferred by the air pressure may be delivered directly through a hose into the fuel tank of an automobile, a vat or other receptacle. To draw the fluid it is only necessary to open a valve. All of the fluid that passes through the system is measured by a liquid meter, which is tested and sealed by the New York City Bureau of Weights and Measures. For use in garages the ordinary garage air pressure system is made use of, and most factores are equipped with a similar system.

Absolute safety is the most important advantage claimed for the system. The liquid cannot be left running, nor is it exposed to the atmosphere at any point. There is no opportunity for the liquid to vaporize and gases to collect. Where large quantities of liquid have to be handled the absence of manual labor also is a feature of considerable importance.

The storage tank is buried underground, as usual. There are three pipe connections at the top, one leading to a filling box at the curb, another to a gage box in the floor (through which the amount of liquid remaining in the tank can be ascertained by means of a gage stick), and the third being the vent, which is carried to the roof of the building. There is an outlet from the bottom of the storage tank which connects with the working tank. From the working tank two




Draw-off panel of the Apsco pressure system

pipes lead to the drawoff panel. Compressed air enters the system at the air inlet valve, passes through the reducing valve, safety valve, air pressure gage, and air control valve. The latter is connected by a link to the self-closing valve and also by the same link to the liquid control valve.

As the air supply is always of much higher pressure than required to operate the system, the reducing valve is adjusted to give the desired pressure, depending upon the height to which the liquid is to be raised and the rate of flow desired. A gage registers the pressure within the system.

In drawing liquid by means of this system the operator firmly grips the self-opening valve, which results in closing the vent line; he then moves the handle to the left as far as the stop. This opens the air control valve and the filter valve, permitting air to pass through line into the working tank, creating a pressure upon the liquid which drives it up through the delivery line, filter valve and meter, after which it is discharged through the hose and nozzle. When the required amount has been drawn, the handle is turned to the right against the stop. This closes the air control and filter valves, thereby shutting off the air and the gasoline discharge line. When the grip on the handle is released the self-closing valve opens, thus allowing the air from the working tank to escape through vent line. As the air leaves the working tank, the latter is refilled from the main tank. Should the finger grip on the self-closing valve be released when the handle is left in position the air will escape through the vent, thus automatically shutting off the flow.

The storage tank is of the ordinary type and can be gaged or filled even when liquid is being drawn from the system. A trapped check valve is inserted in the pipe leading from the storage to the working tank. This check valve closes when pressure is applied to the working tank and opens when the air is released from it. When the check valve is open the working tank will refill from the storage tank and thus will always be full when liquid is to be drawn. This check valve also prevents the possibility of liquid or air being forced back into the storage tank when pressure is applied to the working tank.

The working tank, which is especially made to withstand pressure, has a capacity of 60 gal. The air and fill pipes terminate at the top of the tank, while the discharge pipe is carried to the bottom of the tank and is there fitted with a float and check valve. The check valve holds up the liquid in the discharge line to the level of the hose outlet, thus insuring an immediate flow when pressure is applied. The float valve cuts off the discharge line when the liquid in the working tank has reached a fixed low level, retaining enough liquid in the tank to create a seal and preventing the possibility of air being discharged through the delivery line or meter. The vacuum valve is placed above the draw outlet, preventing any syphonic action on the meter and at the same time venting the hose, thus causing same to drain completely.

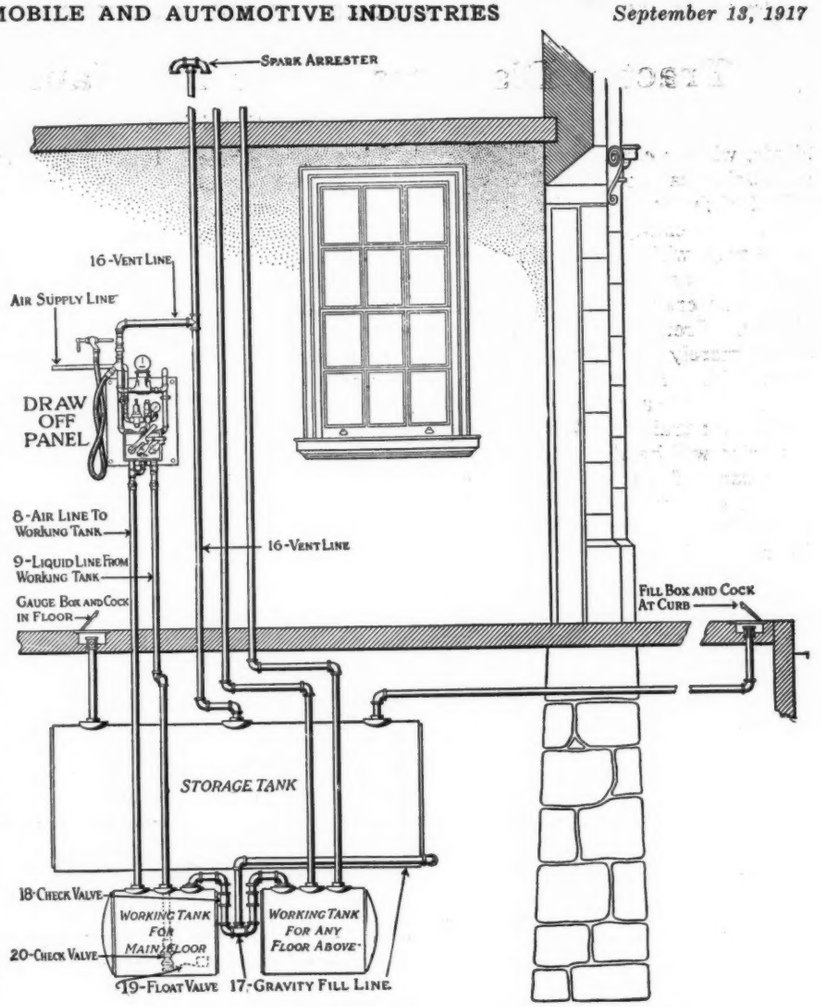



Diagram showing parts and pipe connections of Apsco system

## Domestic Sources of Chromite

CHROMITE, the mineral from which is derived the ferrochromium used in producing chrome and chrome-nickel steels, is in much greater demand since the outbreak of the war, as chromium is used in armor plate and armor-piercing projectiles in addition to its use in high grade construction steel. According to the U. S. Geological Survey, the chief sources of the mineral for the United States during the last few years were Rhodesia, New Caledonia, Turkey and Greece. In 1916 the imports amounted to 114,655 long tons. Owing to the rapid increase in the demand diligent searches for chromite have been made in the United States, and the rate of its production here has increased phenomenally. In 1915 only 255 tons were produced, while in 1916 the production had grown to over 47,000 tons. Most of this was produced in Pacific Coast states, California leading with a production of 44,000 tons, followed by Oregon with 3,000 tons, and Maryland and Wyoming with small quantities.

At Kerby, Ore., T. W. Gruetter has established a plant for concentrating black sand to recover its gold and platinum. The black sand of the Klamath Mountains usually contains a considerable amount of chromite, and it is believed that by adding magnetic separators to Gruetter's plant to remove the other minerals from the tailings sufficient chromite may be obtained from the black sand in areas of chromiferous serpentine to make the operation financially successful. The process will evidently yield a high grade of chrome ore, which may be suitable for special uses.

There is considerable chromite in Cuba, but scarcely anything is known of its occurrence in Mexico or Central and South America.

Ferrochrome, the alloy used in making chrome steel, is now manufactured in the United States by electro-metallurgic methods, almost wholly in the East, at the plants of the Electro Metallurgical Co. at Niagara Falls and elsewhere. It is reported, however, that the Noble Electric Steel Co. has three furnaces at Heroult, Cal., operating to their full capacity in producing manganese, chrome and silica steels.

## Hall-Scott Piston Casting

IN the recent description of the Hall-Scott A-7-A engine it was erroneously stated that the aluminum pistons of this engine were die-cast. As a matter of fact they are not die-cast, but cast in metal molds by the Aluminum Castings Co., of Cleveland.